

Northeastern University



School of Law Library

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

HEARINGS

BEFORE THE

TEMPORARY NATIONAL ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

SEVENTY-SIXTH CONGRESS

THIRD SESSION

PURSUANT TO

Public Resolution No. 113

(Seventy-fifth Congress)

AUTHORIZING AND DIRECTING A SELECT COMMITTEE TO
MAKE A FULL AND COMPLETE STUDY AND INVESTIGA-
TION WITH RESPECT TO THE CONCENTRATION OF
ECONOMIC POWER IN, AND FINANCIAL CONTROL
OVER, PRODUCTION AND DISTRIBUTION
OF GOODS AND SERVICES

PART 30 No. 1

**TECHNOLOGY AND CONCENTRATION
OF ECONOMIC POWER**

APRIL 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 22, 23, 24, 25, AND 26, 1940

Printed for the use of the Temporary National Economic Committee



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1940

124491

NORTHEASTERN UNIVERSITY SCHOOL of LAW LIBRARY

(Created pursuant to Public Res. 113, 75th Cong.)

JOSEPH C. O'MAHOONEY, Senator from Wyoming, *Chairman*
HATTON W. SUMNERS, Representative from Texas, *Vice Chairman*

WILLIAM H. KING, Senator from Utah

WALLACE H. WHITE, Jr., Senator from Maine

CLYDE WILLIAMS, Representative from Missouri

B. CARROLL REECE, Representative from Tennessee

THURMAN W. ARNOLD, Assistant Attorney General

* WENDELL BERGE, Special Assistant to the Attorney General
Representing the Department of Justice

JEROME N. FRANK, Chairman

LEON HENDERSON,* Commissioner

Representing the Securities and Exchange Commission

GARLAND S. FERGUSON, Commissioner

* EWIN L. DAVIS, Chairman

Representing the Federal Trade Commission

ISADOR LUBIN, Commissioner of Labor Statistics

* A. FORD HINRICHS, Chief Economist, Bureau of Labor Statistics

Representing the Department of Labor

JOSEPH J. O'CONNELL, JR., Special Assistant to the General Counsel

* CHARLES L. KADES, Special Assistant to the General General

Representing the Department of the Treasury

SUMNER T. PIKE, Business Adviser to the Secretary of Commerce

Representing the Department of Commerce

JAMES R. BRACKETT, *Executive Secretary*

~~THEODORE~~ J. KREPS, *Economic Adviser*

* Alternates.

II

REPRINTED

BY

WILLIAM S. HEIN & CO INC

BUFFALO, N. Y

1968

DEC 3 1969

CONTENTS

Testimony of—	Page
Barkin, Solomon, economist, Textile Workers Union of America	16831-16877
Bean, Louis H., economist, Bureau of Agricultural Economics, Department of Agriculture	16940-16963, 16973-16999
Blunt, I. L., secretary, National Federation of Textiles	16878-16899
Carey, James B., general president of the Electrical, Radio, and Machine Workers of America, national secretary of the Congress of Industrial Organizations	16727-16747
Carr, William G., secretary, Educational Policies Commission	17169-17186
Clark, Harold F., professor of education, Teachers College, Columbia University	17105-17121
Conze, G. R., president, Susquehanna Silk Mills	16878-16899
Driesen, Daniel, legislative representative, American Communications Association (Congress of Industrial Organizations)	16747-16756
Elliott, William S., vice president, International Harvester Co.	17078-17080
Green, William, president, American Federation of Labor	17122-17140
Gill, Corrington, assistant commissioner, Work Projects Administration	17220-17242
Griffith, Paul E., president, National Federation of Telephone Workers	16697-16726
Harrison, George, president, Brotherhood of Railway Clerks	16609-16669
Holcomb, Ernest, Division of Farm Population and Rural Welfare, Department of Agriculture	16922-16940
Johnson, Sherman E., head of Division of Farm Management and Costs, Department of Agriculture	16940-16963
Kennedy, Thomas, secretary-treasurer, United Mine Workers of America	17186-17203
Kifer, R. S., Division of Farm Management and Costs, Department of Agriculture	16940-16963
Lubin, Isador, Commissioner of Labor Statistics, Department of Labor	17242-17267
McCormick, Fowler, vice president, International Harvester Co.	17001-17040
Merrill, Lewis, president, United Office and Professional Workers of America	16796-16829
Murray, Philip, chairman, Steel Workers Organizing Committee	16453-16516
Nichol, F. W., vice president, International Business Machines Corporation	16760-16796
Norton, John K., professor of education, Teachers College, Columbia University	17084-17105
Parmelee, J. H., director, Bureau of Railway Economics, Association of American Railroads	16546-16607
Pelley, J. J., president, Association of American Railroads	16517-16546
Polakov, Walter N., director, Engineering Department, United Mine Workers of America	17186-17203
Renton, William, of Coverdale, Pa.	17195-17199
Reynolds, John W., Commercial Telegraphers' Union	16688-16693
Rieve, Emil, president, Textile Workers Union of America	16831-16877
Russell, Michael, of New Castle, Pa.	16461-16469
Ruttenberg, Harold J., Steel Workers Organizing Committee	16453-16516
Sullivan, Rose, American Federation of Labor	16669-16688
Taylor, Carl, Division of Farm Population and Rural Welfare, Department of Agriculture	16922-16940
Taylor, Paul, professor of economics, University of California	17040-17078
Wall, Norman J., Division of Agricultural Finance, Bureau of Agricultural Economics, Department of Agriculture	16963-16973

Testimony of—Continued.

Page

Ware, Caroline F., associate professor of social history and social economy, American University.....	17204-17219
Watson, Thomas J., president, International Business Machines Corporation.....	16760-16796
Weintraub, David, Work Projects Administration.....	17220-17242
Whitney, Byrl, Brotherhood of Railroad Trainmen.....	16899-16919
Winnek, Douglas F.....	16350-16358
Wright, J. C., assistant commissioner for vocational education, United States Office of Education.....	17140-17168

Statement of—

Davis, Watson, director, Science Service.....	16260-16291
Ford, Edsel, president, Ford Motor Co.....	16319-16349
Hook, Charles R., president, The American Rolling Mill Co.....	16391-16451
Kettering, Charles F., vice president, General Motors Corporation.....	16292-16317
Kreps, Theodore J., economic adviser, Temporary National Economic Committee.....	16209-16267
McCarroll, R. H., engineer, Chemical and Metallurgical Division, Ford Motor Co.....	16319-16349
Moekle, H. L., auditor, Ford Motor Co.....	16319-16349
O'Mahoney, Joseph C.....	16207, 16208
Thomas, R. J., president, United Automobile Workers.....	16359-16390

Report on the depression of 1873.....	16210
Invention of the art of invention.....	16212
Why are innovations introduced?.....	16213
Important types of technological change.....	16214
Labor-saving devices.....	16217
How measure the impact of technology?.....	16218
New industries created by technology.....	16219
Distress to laborers caused by machines.....	16220
Productivity of labor.....	16222
Increased capital per unit of product.....	16224
Shortened working hours.....	16225
The mining industry.....	16229
The national labor force.....	16231
Problem of the ages.....	16233
The potential working force.....	16234
The efficiency of capital.....	16240
Technology and the business cycle.....	16243
Does industry need more capacity?.....	16244
Who benefits from technology?.....	16246
How many are now employed?.....	16249
Average cost of production.....	16250
Nonproductive workers.....	16251
The general effects of technology.....	16252
Economic policy.....	16255
Technology and modern business empires.....	16256
Technology and pressure groups.....	16258
The world an economic unit.....	16259
Technology and war.....	16261
America unlimited.....	16262
Modern industrial research.....	16270
Government research expenditures.....	16272
Fields for further research.....	16274
Atomic power.....	16277
Suggested use of gold.....	16278
Long-range weather forecasting.....	16282
Metal alloys.....	16285
Chemical therapy.....	16286
Genetics.....	16287
Spread of technical progress.....	16290
Group V. Individual research.....	16293
Research in General Motors.....	16294
Patent policy of General Motors.....	16296
Government aid to research.....	16299
Accelerating rate of invention.....	16300

	Page
Mass production and mass purchasing power.....	16303
Photosynthetic energy.....	16305
General Motors research budget.....	16307
Interorganizational cooperation.....	16309
Effect of patents on invention.....	16311
Cost of industrial research.....	16313
Low-priced automobiles.....	16315
Cost of labor within the Ford plant.....	16322
Proportion of skilled to unskilled workers.....	16325
A \$500 automobile.....	16330
New versus replacement car market.....	16332
Feasibility of lower-priced car.....	16334
Effect on society.....	16337
Technology and migration of industry.....	16337
Cost of production as measure of effect of technology.....	16338
Increase of decrease of skill.....	16341
Supply of labor.....	16343
Decentralization in Ford Motor Co.....	16346
Trivision for X-ray purposes.....	16352
Trivision in aerial photography.....	16354
Problems of financing development.....	16356
Changes in productivity since 1928.....	16360
Wages and technology.....	16362
Effect of the "speed-up".....	16367
1. Intensified labor. (speed-up).....	16370
Speed-up and older worker.....	16372
Effect of shortened hours on productivity.....	16375
Plant investment and productivity.....	16377
Displacement of men by machines.....	16378
Production and employment since 1929.....	16381
Regularity of employment.....	16384
Effect of mechanization upon skill.....	16386
First continuous sheet mill installed in 1926.....	16393
Advantages to labor from continuous mills.....	16394
Effect of continuous mills on age of workers.....	16397
Operation of continuous mills at Middletown.....	16399
Displacement of labor.....	16403
Production in American Rolling Mill Co.....	16405
Employment and earnings.....	16407
Annual earnings of ARMCO workers.....	16409
Change in quality of steel.....	16413
Decline in sheet steel prices.....	16415
Proposed reduction in hours.....	16417
Labor costs for steel production.....	16419
Causes of increased volume.....	16424
ARMCO research in housing.....	16427
Displacement of other industries by sheet steel.....	16428
Financing of new capacity.....	16429
Production on continuous hot mills.....	16432
Lack of investment as cause of unemployment.....	16436
Employment in manufacturing industries.....	16438
National Association of Manufacturers' study of older workers.....	16443
Provisions for displaced employees.....	16448
Technological changes in the steel industry.....	16456
Labor displacement in hot strip mills.....	16458
Provision for displaced workers.....	16466
Ghost towns.....	16469
Cost of production in mechanized mills.....	16474
New steel technology covers industry.....	16478
Mergers and consolidations.....	16480
Greatest change in employment after 1936.....	16484
Extent of mechanization cost borne by labor.....	16491
Steel employment in 1929 and 1939.....	16494
Increase in production from 1929 to 1939.....	16497
Interindustry competition.....	16500
Problem of new entrants to labor force.....	16501

	Page
Providing for displaced workers.....	16504
Proposed regulation of mechanization.....	16508
Industrial cooperation invited.....	16513
Technological change in the railroad industry.....	16518
Future progress.....	16520
Total labor force on the railroad.....	16521
Competition with other forms of transportation.....	16524
Railroad labor policies.....	16530
Efforts to increase business.....	16533
Effect of technology on employment.....	16534
Effect of increased business on employment.....	16536
Distribution of railway earnings.....	16539
Effect of displacement on average age of workers.....	16542
Character of the railroad industry.....	16547
Physical plant of the railroads.....	16552
Installation of new equipment.....	16562
Investments in railroads 1923-39.....	16564
Railroad purchases of supplies.....	16568
Diversion of traffic from railways.....	16572
Trend of employee compensation.....	16577
Railroad costs of operation.....	16585
Mechanization and wage changes.....	16590
Details of labor displacement by mechanization.....	16595
Resistance to technological change.....	16598
Summary of technological changes.....	16601
Prospects for employment.....	16605
Technological change in railroad operation.....	16610
Mechanization in shop service.....	16611
Railway expenditures for new lines and extensions.....	16614
Increased efficiency of engines.....	16616
Speed of railroad transportation.....	16618
Decline in job opportunities.....	16621
Classification of employees.....	16624
Distribution of railroad service.....	16626
Increase of labor productivity.....	16629
Unemployment in various labor groups.....	16631
Rate of technological change.....	16633
Effect of increased traffic on employment.....	16635
Introduction of dial switchboard.....	16643
Analysis of labor force.....	16645
Displacement after 1930.....	16647
Qualifications for employment in American Telephone & Telegraph Co.....	16650
Progress of dialization after 1933.....	16653
Change in character of labor force.....	16654
Increase of business in relation to employment.....	16658
Opportunity for investment.....	16661
Construction in relation to general operation.....	16663
Division of revenues in A. T. & T.....	16664
Possibilities of expansion.....	16667
Analysis of effect of displacement.....	16670
Displacement in the Boston area.....	16672
Dial service versus manual service.....	16674
Labor displacement as a purpose of dialization.....	16680
Earnings of employees.....	16681
Unionization in the A. T. & T.....	16683
Employee attitude toward the dial.....	16685
Technological change in telegraphy.....	16689
Labor displacement in the telegraph industry.....	16693
Concentration of ownership in American Telephone & Telegraph Co.....	16694
Reduction of employment.....	16699
Effect of rate reductions on volume of business.....	16706
Effect of mechanization.....	16709
Policies of unions in A. T. & T.....	16711
Employee policies in the Bell System.....	16714
Separation pay.....	16718
Union attitude toward mechanization.....	16721

	Page
Suggestions for cushioning displacement.....	16724
Introduction of letters relating to insurance hearings.....	16726
Effect of technology in the electrical industry.....	16729
Remedies for unemployment.....	16733
Leveling of skills.....	16737
Effect of patent rights on technological change.....	16740
Union agreements as to labor displacement.....	16743
Prospects for absorption of unemployed.....	16746
Mechanization of telegraph industry.....	16748
Union agreements of technological change.....	16749
Consolidation and labor displacement.....	16752
Technology and economic recovery.....	16760
International Business Machine's share of the business machines industry.....	16761
Wages paid and hours worked.....	16762
Accounting machines and employment.....	16764
Advantages of business machine.....	16767
Direct and indirect I. B. M. employment.....	16770
Effect of mechanization upon earnings.....	16775
Physical and social effects of mechanization.....	16781
Classification of labor force.....	16783
Training for reemployment.....	16785
Prospect of foreign markets.....	16787
Responsibility of industry to displaced workers.....	16790
Provision for unemployables.....	16794
The growth and composition of white-collar group.....	16799
Industrial urban concentration.....	16801
Earnings of white-collar workers.....	16805
Changing status of clerical workers.....	16807
The introduction of the machine.....	16808
Rate of introduction of machines.....	16809
Machine displacement.....	16811
Effect on skilled workers.....	16812
Promotion policies.....	16812
Public policy and business practice.....	16815
Unemployment—secular or technological?.....	16818
Futile prospects for employment.....	16821
Union contracts and technological change.....	16823
Changing status of white collar worker.....	16826
Non-mechanical changes in technology.....	16828
Technological change in the textile industry.....	16832
Technological advances in cotton textiles.....	16836
Technological advances in woolen and worsted industry.....	16839
Technological advances in synthetic yarn.....	16841
Technological advances in other textile industries.....	16842
Economic and social effects of technological change.....	16843
Effect on skilled workers.....	16850
The changing character of the textile industry.....	16852
Union policy regarding technological change.....	16855
Improvement in earnings.....	16858
Job tenure.....	16859
Separation allowances and pensions.....	16861
Unions as a factor in mechanization.....	16864
Migration of textile industry.....	16867
Division of labor in textile plants.....	16870
Effect of unionization on production costs.....	16873
Prospects for increased employment.....	16876
Shift from silk to rayon.....	16879
Introduction of automatic looms.....	16882
Shift of production away from silk mills.....	16887
Reduction in silk and rayon prices.....	16890
Prospects of continued mechanization.....	16892
Future of fiber industry.....	16894
Labor displacement in silk mills.....	16896
Employment and pay rolls.....	16900
Productivity of railroad labor.....	16903

	Page
Reemployment program in the railroad industry.....	16906
Railroad consolidations.....	16910
Railroad finances.....	16911
Six-hour day.....	16915
Displacement as a result of consolidation.....	16916
Technology in agriculture.....	16922
Labor force on the farm.....	16926
Earnings for farm laborers.....	16933
"Gainfully employed" in agriculture.....	16938
Productivity in agriculture.....	16941
Mechanization of farming.....	16950
Increased efficiency in agriculture.....	16954
Prospects for increased employment.....	16958
Effect of mechanization on investment.....	16959
Comparative costs of operation.....	16961
Farm indebtedness and farm values.....	16964
Farm ownership and operation.....	16967
Farm interest rates.....	16971
Effect of mechanization on labor costs.....	16975
Changes in farm labor force.....	16978
Increase in farm productivity.....	16981
Farm income.....	16982
Prospect of great technological change.....	16987
Future movement of farm population.....	16991
Increase of corporate farm ownership.....	16993
Effect of increased employment on farm production.....	16996
Mechanization in agriculture.....	17005
Farmers' demand for mechanization.....	17011
Major effects of the use of farm machinery.....	17012
Farm machinery as labor saver.....	17015
Future trend toward small machines.....	17017
Effect of tenant farming on mechanization.....	17020
Cost of mechanizing a small farm.....	17023
Credit policy of International Harvester.....	17026
Effect of mechanization on labor costs.....	17030
Prospect of future technological change.....	17032
Prospect for increased farm employment.....	17035
Employment in farm machinery industry.....	17038
Effects of farm mechanization.....	17041
Origin of migrants to the west coast.....	17044
Sharecropping on cotton plantations.....	17046
Mechanization in the wheat belt.....	17049
Corn belt mechanization.....	17051
Expansion of holdings after mechanization.....	17053
Agricultural concentration by States.....	17056
Cash payments to labor.....	17060
Citizens' associations and farm labor.....	17063
Future of family-sized farm.....	17065
Displacement of farm owners and laborers.....	17068
Mechanization as a force for expanding acreage.....	17070
Recommendations to eliminate displacement.....	17073
Economy of operating large units.....	17078
Potential production of the United States.....	17085
Increase in occupational training.....	17088
Possibility of discrimination in vocational training.....	17091
Increased emphasis on skills.....	17093
Potentialities of domestic consumption.....	17096
Consumption lags behind production.....	17099
"Mortality" in high-school education.....	17101
Increased productivity of labor.....	17104
Need for cataloguing of available jobs.....	17107
Mobility of labor.....	17110
Productivity of trained labor.....	17112
Training to reduce unemployment.....	17115
Increased competition for highly paid positions.....	17119
Increase in available labor force.....	17124

	Page
Production and income since 1929.....	17127
Increased productivity.....	17129
Technology and wages.....	17131
Suggestions for dealing with labor displacement.....	17134
A. F. of L. attitude toward dismissal wage.....	17136
The vestibule school.....	17141
Private schools.....	17144
Public schools.....	17144
Retraining for the employed and unemployed.....	17146
The need for a larger vocational program.....	17148
How a larger vocational program should be established.....	17150
Industrial training.....	17151
Occupational training in public schools.....	17154
Training of the unemployed.....	17156
Adequacy of present training program.....	17159
Efficacy of vocational guidance.....	17165
Need for economic literacy.....	17171
Economic information needed.....	17172
Summary.....	17175
Democracy depends upon economic knowledge.....	17177
Use of education for recovery.....	17180
Increased emphasis on skills.....	17182
Why youth leave school.....	17184
Increased productivity.....	17187
Competition of coal and gas.....	17193
Dismissal wages.....	17198
Labor displacement by mechanization.....	17200
Workers' education.....	17206
Health program arising out of workers' education.....	17209
Workers' education in Sweden.....	17213
Workers' education and economic literacy.....	17217
Industrial recovery after depression.....	17223
Advantage of size in mechanization.....	17226
Effects of mechanization on workers.....	17229
Effect of mechanization on skills.....	17232
Increased unemployment among youth.....	17234
Effects of technology on employment.....	17237
Income distribution and full employment.....	17239
Factors affecting labor productivity.....	17244
Work-creating technological change.....	17247
Labor and capital saving change.....	17248
Changes affecting raw materials.....	17250
Social accounting faulty.....	17252
Displacement and the young and old worker.....	17257
Displacement costs paid by workers.....	17258
Displacement costs chargeable to society.....	17261
Cooperation of employment agencies.....	17264
Schedule and summary of exhibits.....	XI
Monday, April 8, 1940.....	16207
Tuesday, April 9, 1940.....	16281
Wednesday, April 10, 1940.....	16319
Thursday, April 11, 1940.....	16391
Friday, April 12, 1940.....	16452
Monday, April 15, 1940.....	16517
Tuesday, April 16, 1940.....	16600
Wednesday, April 17, 1940.....	16639
Thursday, April 18, 1940.....	16697
Friday, April 19, 1940.....	16759
Monday, April 22, 1940.....	16831
Tuesday, April 23, 1940.....	16921
Wednesday, April 24, 1940.....	17001
Thursday, April 25, 1940.....	17083
Friday, April 26, 1940.....	17169
Appendix.....	17269
Supplemental data.....	17597
Index.....	I

SCHEDULE OF EXHIBITS

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2428. Memorandum: Innovations of major importance to industry.....	16212	17269
2429. Table: Proportion of hand and machine workers in selected industries; based on sample inspections in 1925.....	16214	17276
2430. Table: Employment created by new manufacturing industries.....	16219	17276
2431. Chart: Capital invested, horsepower and product.....	16223	16223
2432. Chart: Productivity, hourly earnings, and unit wage cost in manufacturing, 1919-38.....	16226	16227
2433. Chart: Fixed capital investment, output, and employment in manufacturing, 1919-38.....	16223	16228
2434. Table: Productivity, output, and employment—percentage changes between designated years.....	16229	17277
2435. Table: Index of productivity and unit wage cost in selected groups of industries, 1919-38.....	16229	17278
2436. Table: Production, employment, and productivity in 59 manufacturing industries in 1936.....	16230	17279
2437. Table: Occupational distribution of gainful workers, 1880-1939—as a percentage of all gainful workers.....	16232	17281
2438. Memorandum: Population and employment, 1870-1940.....	16233	17281
2438-A. Chart: Growth of population of the United States 1850-1980.....	16233	17285
2438-B. Table: Growth of population in the United States, 1750-1980.....	16233	17286
2438-C. Table and Chart: Estimated labor force of the future in the United States, 1940-1980.....	16233	17286
2438-D. Chart: Gainfully employed in the United States, 1870-1940.....	16233	17288
2438-E. Chart: Percentage of total population gainfully employed, by occupational groups, United States, 1870-1940.....	16233	17289
2438-F. Chart: Number of workers gainfully employed, by occupational groups, United States, 1870-1940.....	16233	17290
2438-G. Chart: Distribution of gainfully employed, by occupational categories, United States, 1870-1940.....	16233	17291
2438-H. Chart: Increase in population and in gainful employment, 1940 over 1870, by occupation, United States.....	16233	17292
2438-I. Charts: Gainfully employed workers in the United States, by occupational groups, 1930.....	16233	17293
2438-C. 2439. Memorandum: Capital-savings innovations.....	16239	17300
2439-A. Table: Industrial processes.....	16239	17301
2439-B. Table: Fifty typical installations of material-handling equipment.....	16239	17302
2439-C. Memorandum: The myth of a profitless prosperity.....	16239	17304
2439-D. Table: Statistics on values, production, revenues.....	16239	17309
2440. Chart: Fixed capital investment, output, and employment in the automobile industry, 1919-38.....	16239	16239
2441. Table: Indexes of fixed capital, output and employment in selected industries, 1919-38.....	16240	17310

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2442. Memorandum: Effects of the radio telegraph and tele- phone and of radio broadcasting.....	16253	17311
2443. Chart: Technical progress in travel time.....	16259	16259
2444. Chart: Swedish national income and value added by manufacture compared with U. S. from 1860.....	16262	16263
2445. Table: Real wages.....	16264	17313
2446. Statement: The mechanism of photosynthesis and national or world economy.....	16276	17313
2447. Statement: Atomic power.....	16277	17315
2448. News item: Hundred-million-volt, forty-nine hundred- ton atom smasher made possible at University of California through gift from Rockefeller Founda- tion.....	16278	17316
2449. Statement: Summary of U. S. Weather Bureau work in long-range forecasting.....	16284	17316
2450. Statement: A practical application of knowledge de- rived from the study of plants.....	16287	17319
2451. Letter from Elton Mayo to Watson Davis on human relations, executive authority, and unemployment.....	16289	17320
2452. Statement: Background of conflicts.....	16289	17325
2453. Chart: Diagram of a complete rolling-mill plant pro- ducing sheets.....	16399	(1)
2454. Chart: Diagram of a complete old style hand mill producing sheets.....	16401	{facing 16401
2455 to 2459. Photographs of strip mills.....	16402	(1)
2460. Table: Continuous sheet and wide strip mill installa- tions.....	16402	17326
2461. Table: Estimate of number of workers employed in industry in hand mill processes.....	16402	17326
2462. Table: ARMCO production.....	16405	17327
2463. Table: Distribution of ARMCO sheet shipments be- tween continuous and hand mills.....	16406	17327
2464. Table: ARMCO parent company employment, aver- age number of employees.....	16407	17327
2465. Table: Employment, wages, hours, and production, ARMCO Middletown plant.....	16407	17328
2466. Table: Expenditures for construction, ARMCO Middletown plant.....	16411	17328
2467. Table: ARMCO average iron and steel sheet selling prices.....	16413	17328
2468. Table: Iron and steel industry . . . employment wages and production.....	16416	17328
2469. Table: Iron and steel industry — increase in sheet and tin-plate production.....	16423	17329
2470. Table: Distribution of sheet and tin-plate production to consuming industries.....	16425	17329
2471. Table: Examples of increased use of sheet steel.....	16429	17329
2472. Table: Industry expenditures for continuous mill construction.....	16430	17330
2473. Chart: Index of hot rolled steel production.....	16432	16433
2474. Chart: Sheet and tin-plate production and number of continuous mills operating.....	16434	16434
2475. Chart: U. S. Department of Labor indexes of employ- ment in manufacturing industries.....	16439	16439
2476. Memorandum: Plan for handling hot mill employees in connection with new finishing mills.....	16448	17330
2477. Table: Continuous hot strip mills in the United States and cold reduction strip mills.....	16457	17331
2478. Article: War and steel ghost towns.....	16469	17332
2479. Table: Displacement of men by automatic strip mills.....	16470	17339

¹ On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2480. Table: Cost of production of tin-plate hand mills.....	16474	17341
2481. Book: Employment and productivity in a sheet steel mill, by Jennette R. Gruener.....	16477	(1)
2481-A. Memorandum: A summary of "Employment and productivity in a sheet steel mill".....	16477	17341
2482. Table: Mergers and consolidations by major steel producers.....	16481	17342
2483. Chart: Pay rolls and man-hours per ton of output.....	16482	16483
2484. Memorandum: Explanation of material submitted in Exhibits 2485-2488.....	16484	17343
2485. Chart: Man-hours per ton of ingots produced.....	16484	16485
2486. Chart: Wages per ton of ingots produced.....	16484	16486
2487. Chart: Relation of production to pay rolls.....	16484	16487
2488. Chart: Relation of production to employment.....	16484	16488
2489. Table: Comparison of working force, wages, and production in continuous butt-weld pipe mills and in hand style butt-weld pipe mills.....	16506	17345
2490. Memorandum: Technology and employment—description of terms.....	16516	17346
2491. Table: Mileage of railway tracks operated.....	16552	17350
2492. Table: Miles of road constructed or abandoned.....	16553	17350
2493. Chart: Locomotives—number and tractive power.....	16557	16557
Table: Locomotives.....	16558	17351
2494. Chart: Freight-carrying cars.....	16559	16559
Table: Freight-carrying cars.....	16559	17351
2495. Table: Installation of new equipment.....	16562	17352
2496. Table: Passenger-train cars.....	16562	17352
2497. Chart: New rails laid in replacement.....	16562	16563
Table: Rails laid in replacement and wooden ties laid in previously constructed tracks.....	16562	17353
2498. Chart: Gross expenditures for additions and betterments, 1923-39.....	16564	16564
Table: Gross expenditures for additions and betterments.....	16564	17353
2499. Chart: Railway purchases, 1923 to 1939.....	16568	16568
Table: Purchases of fuel, material, and supplies.....	16568	17354
2500. Table: Tons of revenue freight originated.....	16569	17354
2501. Chart: Revenue ton-miles.....	16569	16570
Table: Freight traffic.....	16569	17355
2502. Chart: Revenue passenger-miles.....	16569	16571
Table: Passenger traffic.....	16569	17355
2503. Chart: Average revenue per ton-mile.....	16570	16572
Table: Average revenue per ton-mile.....	16570	17355
2504. Chart: Average revenue per passenger-mile.....	16572	16573
Table: Average revenue per passenger-mile.....	16572	17356
2505. Chart: Indexes of distribution and rail shipments.....	16573	16574
Table: Indexes of distribution and rail shipments.....	16573	17356
2506. Table: Income account, class I railways, United States.....	16575	17357
2507. Railway freight traffic trends.....	16575	(1)
2508. Chart: Net income or net deficit after fixed charges.....	16577	16577
Table: Condensed income account.....	16577	17358
2509. Chart: Total operating revenues, total operating expenses and net railway operating income.....	16577	16578
2510. Chart: Rate of return.....	16577	16579
Table: Property investment, net railway operating income and rate of return.....	16577	17358
2511. Chart: 1939 and 1916 railway dollar compared.....	16577	16579
Table: How the railway dollar is spent.....	16577	17359
2512. Table: Railway operating expenses.....	16577	17359

1 On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits.	Intro- duced at page—	Appears on page—
2513. Chart: Maintenance ratio.....	16577	16580
2514. Chart: Five year averages compared with year 1916.....	16577	16580
Table: Railway taxes per dollar of earnings.....	16577	17360
2515. Chart: Percent of total mileage operated by receivers or trustees.....	16577	16581
Table: Railway receiverships and trusteeships at close of each year, 1921 to 1939.....	16577	17360
2516. Chart: Trend in railway supply costs since May 1933.....	16577	16581
Table: Index of railway material and supply costs.....	16577	17361
2517. Chart: Employees and hourly compensation.....	16577	16582
Table: Employees, hours, and compensation.....	16577	17361
2518. Chart: Unit cost of operation.....	16585	16586
Table: Unit cost of operation.....	16585	17362
2519. Chart: Freight train speed—miles per hour between terminals.....	16586	16587
2520. Chart: Freight cars per train.....	16586	16587
2521. Chart: Gross ton-miles per freight train-hour.....	16586	16588
2521-A. Table: Freight operating averages.....	16586	17362
2522. Chart: Fuel conservation.....	16591	16592
Table: Fuel conservation.....	16591	17363
2523. Chart: Loss and damage expenses per dollar of freight revenue.....	16592	16593
Table: Loss and damage expenses.....	16592	17363
2524. Chart: Casualties to employees in train, train-service and nontrain accidents.....	16592	16594
Table: Casualties to employees in train, train-service, and nontrain accidents.....	16592	17364
2525. Chart: Casualties to passengers on trains in train and train-service accidents.....	16592	16594
Table: Casualties to passengers on trains in train and train-service accidents.....	16592	17364
2526. Chart: Total loss and damage and injuries to persons —expenses per dollar of total operating reve- nues.....	16592	16595
Table: Loss and damage and injuries to persons, ex- pense.....	16592	17365
2527. Memorandum: Detailed analysis of technological advance in the railroad industry with respect to maintenance of way.....	16595	(1)
2528. Chart: Example of labor-saving machine.....	16597	16599
2529. Chart: Burro crane.....	16600	{ Facing 16600
2529-A. Photograph of burro crane.....	16600	{ Facing 16600
2529-B. Table: Burro crane.....	16600	17366
2530. Table: A typical main track railroad.....	16601	17367
2531. Table: Total railway capital outstanding.....	16614	17367
2532. Table: Investment in road and equipment.....	16614	17368
2533. Table: Number and tractive effort of steam loco- motives.....	16615	17368
2534. Table: Average tractive effort of steam locomotives in service.....	16616	17369
2535. Table: Fuel consumed in freight and passenger service.....	16616	17369
2536. Table: Locomotives, passenger and freight cars in- stalled and retired.....	16617	17370
2537. Table: Average capacity of freight cars in service.....	16617	17370
2538. Table: Ties laid in replacement.....	16619	17371
2539. Table: Annual expenditures for small tools and sup- plies, and roadway machines.....	16619	17371

1 On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2540. Table: Total number of employees, total number of hours worked, and total compensation.....	16621	17372
2541. Table: Average number of employees by major sub- division.....	16624	17373
2542. Table: Average hourly or daily earnings of employees by major subdivisions.....	16625	17374
2543. Chart: Average hourly compensation of railroad em- ployees in the United States.....	16625	17376
2544. Table: Total operating revenues and total employees' compensation.....	16626	17376
2545. Table: Distribution of railway operating revenues.....	16626	17377
2546. Table: Operating revenue per employee, per hour of service and per dollar of compensation.....	16627	17378
2547. Chart: Revenue and wages per ton-mile.....	16628	16628
Table: Freight revenues per revenue ton-mile, etc.....	16628	17378
2548. Table: Total mileage of track operated.....	16629	17379
2549. Chart: Employees and wages per mile of track oper- ated.....	16629	17379
2550. Chart: Revenue freight ton-miles per employee.....	16629	17380
Table: Revenue freight ton-miles per employee.....	16629	17380
2551. Chart: Total revenue freight ton-miles and total wages.....	16629	17381
Table: Wages paid per 1,000 revenue ton-miles.....	16629	1738
2552. Chart: Gross ton-miles per employee.....	16629	17382
Table: Gross ton-miles per employee.....	16629	17382
2553. Chart: Ton-miles per dollar of wages, etc.....	16629	17383
Table: Wages per 1,000 gross ton-miles.....	16629	17383
2554. Chart: Operating expenses per 1,000 revenue ton- miles.....	16629	17384
Table: Operating expenses per 1,000 revenue ton-miles.....	16629	17384
2555. Chart: Operating expenses per 1,000 gross ton-miles.....	16629	17385
Table: Operating expenses per 1,000 gross ton-miles.....	16629	17385
2556. Table: Revenue freight ton-miles and gross ton-miles per dollar of operating expense.....	16629	17386
2557. Table: Operating expenses per mile of road and per mile of all tracks.....	16629	17386
2558. Table: Increased efficiency and productivity reflected.....	16629	17387
2559. Table: Cost of clearing wrecks, and damage to property.....	16629	17387
2560. Table: Traffic units.....	16629	17388
2561— 2568. Tables: Decrease in employment opportunities.....	16629	17388
2569. Chart: Growth of the Bell System.....	16640	16640
2570. Chart: Employees and payroll, Bell System.....	16642	16641
2571. Chart: Force losses, Bell System.....	16647	16646
2572. Statement: Technology in the Bell System with par- ticular reference to employment.....	16656	17396
2573. Chart: Production employment and income distribu- ted, Bell System, 1919-1938.....	16664	16665
Table: Production, employment and income distribu- ted, etc.....	16664	17407
2574. Article: "The Dial Telephone and Unemployment," from Monthly Labor Review, February 1932.....	16678	(1)
2575. Article: "Text of Epochal Telephone Decision," from the Journal of Electrical Workers and Operators, June 1934.....	16678	(1)
2576. Article: "Costly Dials Make Subscribers Work," from the Journal of Electrical Workers and Oper- ators, March 1935.....	16679	(1)

1 On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2577. Article: "Gifford's Chickens Come Home to Roost," from the Journal of Electrical Workers and Operators, April 1936-----	16679	(1)
2578. Article: "More Glimpses into Private Life of A. T. & T.," from the Journal of Electrical Workers and Operators, December, 1939-----	16679	(1)
2579- Tables: Selected data showing the development 2581. through the years 1926 to 1938, inclusive, of Class A telephone carriers-----	16699	17408
2582. Table: Relative activity of Western Electric Company's plants-----	16705	17410
2583. Table: Bell System—index of output per employee and employee man-hour-----	16705	17411
2584. Table: Progress of dialization in Bell System-----	16705	17411
2585. Table: Production, employment and productivity summary indexes for the telephone industry—Operators: 1919-37-----	16705	17411
2586. Table: Production, employment and productivity summary indexes for the telephone industry—all employees: 1919-37-----	16705	17412
2587 Appears in Hearings, Part 28, appendix, pp. 15634- to 15641-----	16727	-----
2604. 2605. Statement of James B. Carey, general president, United Electrical, Radio and Machine Workers of America-----	16728	17412
2606. Memorandum: List of companies in which workers' conditions were improved by unionization-----	16746	(1)
2607. Table: Wages and hours of labor at the IBM Endicott Plant, 1926-1939-----	16763	17424
2608. Table: Routine clerical workers: Cumulative percentage distribution of annual earnings in large and small cities, 1929-----	16775	17425
2609. Table: White collar workers compared with total gainfully employed-----	16800	17425
2610. Table: Growth of clerical class-----	16800	17426
2611. Table: White collar workers in industry-----	16801	17426
2612. Table: Clerical and professional workers employed and unemployed-----	16804	17426
2613. Table: Distribution of clerical employees in 30 cities-----	16806	17427
2614. Table: Median annual income of clerical and professional employees by age groups-----	16806	17427
2615. Table: Weekly hours of office employees in private business, 1928-----	16806	17427
2616. Table: Overtime compensation table-----	16807	17428
2617. Table: Productivity and labor requirements in manufacture of cotton textiles, 1910 and 1936-----	16838	17428
2618. Table: Percent of increase in man-hour output of processing departments in 1936 compared with 1910-----	16838	17429
2619. Table: Man-hour output in textile industries-----	16839	17429
2620. Table: Index of output per man-hour in the cotton goods industry-----	16839	17429
2621. Table: Labor productivity and man-hour requirements in manufacturing woolsens and worsteds, 1910 and 1936-----	16840	17430
2622. Table: Changes in man-hour output of woolsens and worsteds-----	16840	17430
2623. Table: Annual fiber consumption in the United States-----	16844	17431
2624. Table: Index numbers of wholesale prices of textile products-----	16844	17431

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2625. Chart: Indexes of production, employment and man- hours in the textile industry.....	16845	16845
Table: Outstanding statistical facts in address of Emil Rieve.....	16845	17431
2626. Table: Indexes of total man-hours and employment in the textile industry.....	16846	17432
2627. Table: Spindles in place, 1921-39.....	16850	17433
2628. Chart: Distribution of silk by trades.....	16879	16879
2629. Chart: Production of silk and rayon goods, etc.....	16883	16883
2630. Chart: Production of woven goods.....	16884	16884
2631. Chart: Spot silk and rayon prices, yearly averages.....	16885	16885
2632. Chart: United States consumption of raw silk and rayon yarn in the weaving industry.....	16886	16886
2633. Chart: Income reports of silk and rayon weaving mills.....	16888	16889
2634. Table: Index of employment in manufacturing indus- tries and railroad industry.....	16900	17433
2635. Book: Main Street, not Wall Street.....	16909	(1)
2636. Memorandum: Machinery creates jobs—What of it?.....	16909	17434
2637. Chart: Shifts in occupations, 1870-1930.....	16923	16924
2638. Chart: Working population in agriculture, etc.....	16924	16924
2639. Chart: Movement to and from farms, 1920-38.....	16925	16925
2640. Chart: Estimated rural-farm population.....	16926	16926
2641. Chart: Rural farm population—total entrants to age group 15-64, 1930-40.....	16927	16928
2642. Chart: Totally unemployed and emergency workers, male, living on farms, November 1937.....	16928	16929
2643. Chart: Partly employed males living on farms, etc.....	16930	16930
2644. Chart: Percentage in each tenure class gainfully em- ployed in agriculture, etc.....	16931	16931
2645. Table: Adjusted sharecropper and wage laborer net income in specified localities, 1932-37.....	16933	17440
2646. Table: Income of hired laborers.....	16933	17441
2647. Table: Farm labor income.....	16934	17442
2648. Table: Agricultural employment in the United States, 1909-39.....	16938	17443
2649, 2650. Charts: Hours per acre.....	16941	16942
2651. Chart: Variations by areas in labor used per acre in producing corn, 1909-36.....	16944	16945
2652. Chart: Labor used per acre producing cotton in major areas.....	16944	16946
2653. Chart: Man-hours per acre.....	16946	16947
2654. Chart: Man-hours per 100 bushels.....	16946	16948
2655. Chart: Tractors; number on farms, 1915-39.....	16947	16948
2656. Chart: Horses and mules on farms, 1915-39.....	16949	16949
2657. Chart: Percentage of wheat acreage harvested with combine in 1938.....	16950	16951
2658. Chart: Percentage of acreage of corn harvested with mechanical field picker, 1938.....	16952	16953
2659. Chart: Labor on a 320-acre central Kansas farm.....	16952	16954
2660. Chart: Relation of employment in agriculture to the size of agricultural enterprise.....	16954	16955
2661. Chart: Relation of employment in agriculture to agri- cultural production.....	16956	16956
2662. Chart: Combined investment in work stock, ma- chinery and mechanical power on farms operated with horses and tractors.....	16959	16959
2663. Table: Comparative costs of operating a 320-acre wheat farm with horses or with tractor.....	16961	17444

¹ On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2664. Table: Comparative cost of operating a 200-acre farm with horses or with tractor.....	16962	17445
2665. Table: Expenses of operating plantations with crop- pers and mules, etc.....	16962	17445
2666. Table: Comparison of net plantation income under two systems, etc.....	16962	17446
2667. Chart: Total farm mortgage debt and ratio of debt to value of farm real estate, United States, 1910-39.....	16963	16963
2668. Table: Changes in farm mortgage debt, etc.....	16965	17446
2669. Table: Estimated amount of farm-mortgage loans out- standing, 1910-39.....	16966	17447
2670. Chart: Percentage of the value of farm real estate belonging to the farm operator, etc.....	16967	16968
Table: Percentage of the value, etc.....	16967	17448
2671. Table: Equities in farm real estate, etc.....	16967	17448
2672. Table: Total farm-mortgage debt, etc.....	16969	17449
2673. Chart: Short-term loans to farmers held by commer- cial banks, etc.....	16969	16970
2674. Table: Total farm real estate taxes, etc.....	16972	17450
2675. Table: Estimated number of farms changing owner- ship, etc.....	16973	17451
2676. Table: Farm real estate held by leading lending agen- cies, 1929-39.....	16973	17451
2677. Table: Gross income from farm production, etc.....	16973	17452
2678. Table: Cash farm income, etc.....	16976	17453
2679. Chart: Per capita farm and nonagricultural income, etc.....	16982	16982
2680. Table: Distribution of gross farm income, etc.....	16984	17454
2681. Chart: Price comparisons, farm machines and other products.....	17004	{Facing 17004
2682. Chart: The farm dollar.....	17004	17005
2683. Chart: Origins of migrants to California, 1935-1937.....	17043	17043
2684. Chart: Origins of migrants to Oregon, 1933-1936.....	17045	17046
2685. Chart: Origins of migrants to Washington, 1932-36.....	17046	17047
2685-A. Table: Measures of concentration in California agri- culture.....	17055	17455
2586. Chart: Percentage distribution of number of farms, etc.....	17056	17057
2687. Chart: Farms and wage workers, etc.....	17056	17058
2688. Chart: Average cash expenditure for labor, etc.....	17060	17061
2689. Chart: Farms employing no hired laborers, Pacific region and California.....	17081	17456
2689-A. Expert testimony presented at hearings of the sub- committee of the United States Senate Committee on Education and Labor, etc.....	17064	17456
2690. Chart: Residence in 1930 of 19,786 agricultural fami- lies moving to California, 1930-39.....	17081	17457
2691. Chart: Residence in 1930 of 11,201 agricultural families moving to the Pacific Northwest, 1930-39.....	17081	17458
2692. Chart: Potential productive capacity, income pro- duced, and expenditures for public education, 1929- 1934.....	17084	17459
2693. Chart: Index of educational expenditures and other governmental expenditures, 1926-34.....	17084	17460
2694. Chart: Estimated causes of increase in school costs, 1914-30.....	17084	17461
2695. Chart: Trend in number of youth in the United States, 1920-52.....	17084	17462

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2696. Chart: Percentages of state and local taxes and appropriations for public elementary and secondary schools derived from property taxes, etc., 1935-36	17084	17463
2697. Chart: Effort and adequacy, 1934	17084	17464
2698. Chart: Children under 16 years of age and national incomes	17084	17465
2699. Chart: Proportion of native sons and daughters living in other states, 1930	17084	17466
2700. Chart: Proportion of state residents born outside the state, 1930	17084	17467
2701. Chart: Does education pay?	17084	17468
2702. Chart: Expenditure per pupil in average daily attendance, 1933-34	17084	17469
2703. Chart: Current expense per pupil, etc., 1930-38	17084	17470
2704. Chart: Per capita retail sales, 1933	17084	17471
2705. Chart: Freedom from farm tenancy, 1935	17084	17472
2706. Chart: Rate per 100,000 population of deaths from homicide, 1934	17084	17473
2707. Chart: Freedom from infant mortality	17084	17474
2708. Chart: Percentage of children of high-school age enrolled in public and private schools since 1890	17084	17475
2709. Chart: Realized private production income, 1799-1937	17084	17476
2710. Chart: Why do youth leave school?	17084	17477
2711. Chart: Relation of fathers' occupations to the amounts of education their children received	17084	17478
2712. Chart: The jobs youth want and the jobs they get	17084	17479
2713. Chart: To what extent do youth receive vocational guidance from schools?	17084	17480
2714. Chart: Test scores of high-school seniors	17084	17481
2715. Chart: Enrollment in vocational schools, 1918-1939	17084	17482
2716. Chart: Enrollment in federally aided agricultural departments, 1918-1939	17084	17483
2717. Chart: Enrollment in federally aided trade and industrial classes, 1918-1939	17084	17484
2718. Chart: Enrollment in federally aided home economics departments, 1918-1939	17084	17485
2719. Article: Cooperative part-time diversified occupations program	17145	17486
2720. Table: Number of pupils enrolled in specified vocational schools, federally aided, by type of class, 1918-1939	17145	17489
2721. Table: Amount expended from federal, state, and local money for vocational education, 1918 to 1939	17145	17490
2722, 2723. Photographs: Burgard Vocational High School	17158	{ Facing 17158
2724. Chart: Vocational agriculture	17159	
2725. Chart: Vocational agricultural departments	17159	{ Facing 17164
2726. Chart: Enrollment in vocational schools or classes operated under state plans, 1918-39	17160	
2727. Chart: Enrollment in federally aided trade and industrial classes, 1918-39	17163	17162
2728. Pamphlet: Training for the painting and decorating trade	17167	(1)
2729. Chart: Expenditure of funds for trade and industrial education	17168	17493
2730. Article: Cooperative part-time diversified occupations program	17168	17494

¹ On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits.	Intro- duced at page—	Appears on page—
2731. Table: Number of pupils enrolled in specified vocational schools, etc., 1918-1939-----	17168	17497
2731-A. Chart: Enrollment in federally aided home economics departments, 1918-1939-----	17168	17499
2731-B. Chart: Enrollment in federally aided agricultural departments, 1918-39-----	17168	17500
2732. Table: Amount expended from federal, state, and local money for vocational education, etc., 1918 to 1939-----	17168	17501
2733. Chart: Number and percentage of persons employed in different age groups, as painters, glaziers, and varnishers, 1930-----	17168	17503
2734. Table: Distributive workers, 1930-----	17168	17503
2735. Statement: Examples of study units on economic problems from American secondary schools-----	17178	17504
2736. Statement: Summary of testimony relating to education-----	17179	17515
2737. Statement submitted by Charles O'Neill, president, United Eastern Coal Sales Corporation-----	17186	17516
2738. Memorandum: Technological disemployment in the coal industry-----	17187	17536
2739. Memorandum: Technological changes in bituminous coal mining and their social-economic consequences-----	17199	17551
2740. Chart: Displacement of miners by mechanization in deep bituminous mines-----	17200	17201
2741 to 2743. Chart: Displacement of coal miners, etc-----	17203	17558
2744. Chart: Energy consumption per capita provided by coal and other fuels related to industrial production-----	17203	17561
2745. Chart: Indices of employment and productivity output and man-hours worked in bituminous coal industry-----	17203	17562
2746. Chart: Tonnage of bituminous coal mechanically loaded in deep mines-----	17203	17563
2747. Chart: Petroleum production and revenues in 1937-----	17203	17564
2748. Chart: Displacement of mines by mechanization-----	17203	(1)
2749. Statement: Technological unemployment and decentralization in the rubber industry-----	17219	17564
2750. Chart: Industrial production during three depression periods—1872-1882, 1892-1902, 1929-1939-----	17222	17222
2751. Chart: Industrial production and the labor supply during three depression periods-----	17223	17224
2752. Memorandum: Work Projects Administration, National Research Project, reports published as of April 1940-----	17221	17577
2753 to 2758. Tables: Indexes of production, employment, and productivity in various industries-----	17221	17582
2759. Table: Investment and operating costs of three sizes of petroleum-refining equipment, 1939-----	17221	17584
2760. Table: Cost of instrumentation of three sizes of petroleum-refining equipment, 1939-----	17221	17585
2761. Table: Industrial-instrument expenditures per \$1,000 worth of machinery and equipment-----	17221	17585
2762. Table: Trend toward automatic-control instruments-----	17221	17585
2763. Table: Automatic control of heat treating of steel-----	17221	17585
2764. Table: Concentration of industrial research, 1938-----	17221	17586
2765. Table: Concentration of research in various industries, 1938-----	17221	17586
2766. Table: Labor requirements per unit of output for large and small operations-----	17221	17587

¹ On file with the committee.

SCHEDULE OF EXHIBITS—Continued

Number and summary of exhibits	Intro- duced at page—	Appears on page—
2767. Memorandum: Productivity and employment in agriculture.....	17221	17587
2768. Memorandum: Effects of tractor and motor vehicles on farm labor requirements.....	17221	17588
2769. Memorandum: Effects of changes in field implements on farm labor requirements.....	17221	17588
2770 to 2776. Memoranda: Labor requirements in various agricultural productions.....	17221	17589
2777. Memorandum: Employment and relief problems and migration of the lumber industry.....	17221	17593
2778. Memorandum: Effects of mechanization of bituminous-coal mining on labor requirements.....	17221	17593
2779. Table: Employment status of textile workers during year following mill shut-down in 1935.....	17221	17594
2780. Table: Duration of unemployment since last job of weavers and loom fixers who were unemployed in May 1936.....	17221	17595
2781. Table: Volume of unemployment experienced during 1926-35 by weavers and loom fixers.....	17221	17595
2782. Table: Age distribution of cigar-machine operators and of hand cigar makers whom they replaced.....	17221	17596
2783. Table: Employment status of hand cigar makers during five years following displacement in 1931.....	17221	17596
2784. Chart: Employment and pay rolls, cement.....	17252	17254
2785. Chart: Employment and pay rolls, structural and ornamental metalwork.....	17253	17254
2786. Chart: Employment and pay rolls, lumber-sawmills...	17253	17255
2787. Chart: Employment and pay rolls, brick, tile, and terra cotta.....	17253	17255
2788. Chart: Value of building construction as indicated by building permits.....	17253	17256
SUPPLEMENTAL DATA		
Unnumbered. Letter from William S. Elliott to H. Dewey Anderson in connection with his testimony.....	17079	17597

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

MONDAY, APRIL 8, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:45 a. m., pursuant to adjournment on Saturday, March 23, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senators O'Mahoney (chairman), and King; Representatives Sumners (vice chairman), Williams, and Reece, Messrs. Pike, Hinrichs, O'Connell, and Brackett.

Present also: Representative Richard J. Welch, of California; Frank H. Elmore, Jr., Department of Justice; Dr. Francis Walker, Federal Trade Commission; George E. Biggs, Social Security Board; and Dr. Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Steady improvement in technology has been the distinguishing mark of our time. No generation in history has seen anything to compare with the advance of science and invention accomplished during this generation. More than that, the 10 years since the crash of 1929 have probably seen the establishment of more new industries and greater technological gains in old industries than any decade since the human race first began to measure time.

It was in the midst of the depression that commercial aviation conquered both the Atlantic and the Pacific Oceans. Recovery was still only a dim hope when the railroads began to introduce the streamliner. Communication by telegraph, telephone, and radio was steadily becoming easier and more efficient and more widespread during the same period. The steady advance of chemistry was creating new commodities for the convenience and enjoyment and service of man. Every year saw new and greater improvement in motion pictures, including the altogether remarkable development of technicolor.

The same decade which has been notable for its steady demand upon Congress from the States and the cities of the land for ever larger appropriations to provide work for the unemployed has seen new achievements in every branch of human knowledge and industry. All of these are the gifts of technology to mankind. Yet in the face of them, unemployment of men, unemployment of money, unemployment even of the machine which technology has developed, remains an unsolved problem.

It is clear, therefore, that one of the major tasks to be performed by the use of human intelligence is the adjustment of our wonderful technological civilization to the immediate and pressing needs of human living. So today the Temporary National Economic Com-

mittee begins this hearing to develop the thought of leaders in the world of industry, science, and economics, on this all-important riddle of our time, namely, why it is that in a world of inexhaustible natural resources, inhabited by men who know more about the physical and chemical secrets of nature than all the generations which have preceded them, we still have not learned how to apply the wonders of technology to the abundance of nature in such a fashion as to provide decent jobs for the millions of idle who are able and willing to work.

The leaders who have been invited here to testify are under no direction or restriction of any kind. The committee is only seeking light. We are not trying to prove a case for any remedy or for any approach. We are not seeking to solicit evidence to justify more government, or to justify increased expenditures. We are not trying to prove that men should be regimented by law, limiting their right to work, or that the use of machines should be in any way restricted or made more difficult.

I say this because I want to make it quite clear at the outset that this hearing must not be regarded as in any sense especially designed to implement the bill to reduce unemployment which I recently introduced and which was by many altogether incorrectly described as a tax on machines.

No member of this committee, no employee, no witness, can speak for the committee. In this as in all previous studies, we are pursuing an objective search for facts. Conclusions have not been preconceived, but will take care of themselves when the facts have been developed.

In the preparation of this hearing, the committee has designated Dr. Dewey Anderson, an economic consultant for the committee, who has had broad experience in this general field, to act as counsel and to question the witnesses.

Are you ready to proceed, Dr. Anderson?

DR. ANDERSON. Mr. Chairman and members of the committee, as has been outlined by your chairman, the hearings that will be conducted in the next 3 weeks will attempt to get at certain of the major problems of technology, unemployment and the concentration of industry. In building these hearings, we have sought to get together and bring before you witnesses who represent large industries, or industries in which technology is a paramount feature and in which employment is large.

We do not propose to offer these witnesses as a whole as representative of all that is occurring in industry, but rather as case studies of various aspects of the technological problem. From day to day, in introducing successive witnesses, we will outline the reason for bringing them before you and the matters they propose to discuss.

In today's hearing we break open the problem with a basic study of technology in relation to the concentration of economic power made by Dr. T. J. Kreps, economic adviser of the committee. Following his testimony today, Mr. Watson Davis, editor of *Science Service*, will outline new and impending technology, and lay out some of the fields of technology that are still to be explored.

Dr. Kreps is prepared to discuss the topic at this time as the witness of the committee.

**STATEMENT OF THEODORE J. KREPS, ECONOMIC ADVISER,
TEMPORARY NATIONAL ECONOMIC COMMITTEE**

Dr. KREPS. Technology, or the science of technique, includes all innovations in the arts of production and trade brought about by science, invention, and scientific management. It has created, and is continually transforming, modern industrialism. Its elemental power caused and will continue to make necessary continuous changes and adjustments in our economic, political, and social order. Harnessed to consumer welfare, it is a most powerful servant, capable of opening up a vast industrial frontier of unexplored abundance.

Without technology the United States would still be a primitive society. There would be few large factories, hardly any concentration of production, few large corporations in production, finance, and trade, a much smaller world-wide interchange of large volumes of goods and services, less controversy over foreign-trade policy, and no serious national problem either of idle men, or idle money, or idle machines. There would also be little, if any, leisure, little release from back-breaking toil, few comforts and fewer luxuries, at least for the masses of the people, and certainly no extensive technological base upon which to build that great democratic civilization which is our goal and dream.

The problems of technology being numerous and complex, I propose to raise only a few of what seem to me to be the most important questions and divide my task into three parts.

I. I am going to take a brief glance at the history and background of technology and ask:

(1) What are some of the important innovations which have changed modern methods of production and trade?

(2) Why is the invention of the art of invention the most important of all inventions?

(3) Do technical innovations come along in haphazard fashion or can they be predicted?

(4) Who introduces them? Why?

(5) Will technology transform all branches of human effort, or is its scope limited?

II. In the second portion, I am going to take a look at some of the more important economic effects and ask:

(1) How can one measure the various changes caused by technology?

(2) What important new industries have been created by technology?

(3) What happens when labor is actually displaced? Where do displaced workers go? How long do they have to hunt for a new job? What sort of job do they get? What happens to their pay?

(4) How has technology affected the productivity of the worker?

(5) What has happened to the occupations of our labor force? How?

(6) What special problems are raised by capital-saving inventions?

(7) Who receives the benefits of technology?

(8) Is technology a basic factor in modern business fluctuations?

III. In the third portion, I intend to try to get some notion of the most important general or social effects, and in particular ask:

(1) Without technology would there be so much large-scale production and such large industrial aggregates as there are today?

(2) Is there any connection between technology and the increase in recent decades of the number and power of pressure groups?

(3) Has technology made the world an economic unit?

(4) If man does not learn to control technology, may its power destroy him?

(5) Can it be harnessed to create an "America unlimited"?

Many of the most important technological innovations occurred before the dawn of human history. About 150 years ago that modern miracle of scientific advance and invention commonly called the Industrial Revolution began to speed through the textile industry of Great Britain. Starting slowly at first, it soon spread not only horizontally to continental Europe and thence to the rest of the civilized world, but also vertically with increasing crescendo through industry after industry, iron and steel, railroads, steamships, agricultural implements, public utilities, automobiles, and the myriad wizardries of chemical enterprise.

Throughout its history technology has required a price for its blessings, and consequently it has been subject to resistance. Even in England 150 years ago there were machine-breaking riots, persecution of inventors, and legal restrictions. John Kay, who invented the flying shuttle in 1733, had to leave England. Hargreaves, the inventor of the spinning jenny, was attacked by a mob in his home and his model destroyed. Crompton, after inventing the spinner's mule in 1779, had to flee into hiding.

Technology for decades has been vigorously attacked as one of the major causes of depression, not only in the United States but throughout the world. I am going to cite but one example from our own history.

After the severe depression of 1873, numerous congressional committees were appointed with special instructions to search for causes. Thirteen years later, in 1886, the search culminated in an interesting volume entitled *Industrial Depressions*, constituting the first annual report of the first Commissioner of Labor, the famous Carroll D. Wright.

This study, full of lugubrious prophecies that have not come true, gives a detailed analysis of labor-saving devices of that day, especially the detrimental effects. In short, complaints about technology are as old as the hills. But it should be pointed out with emphasis, they are no older than certain other complaints that are heard at the present time. And, being old, the complaints are not necessarily groundless.

REPORT ON THE DEPRESSION OF 1873

Dr. KREPS. Now let me just look at some of these other causes which businessmen back in the 1870's asserted made it impossible for business to go ahead any further:

Undue influence of agitators.

Disturbed value of gold and silver.

Class legislation.

Extravagance in government expenses.
 Depreciation of currency.
 National debt.
 Acts that startle money lenders, causing them to withdraw funds and refuse loans.
 Low prices for agricultural products.
 Fear of adverse legislation relative to banks.
 Timidity of capital.
 Unfavorable and reckless legislation in Congress.
 Uncertainty of the future monetary standard.
 Democratic Party in power.
 Want of confidence in Government.
 Overproduction.
 Political distrust.
 Want of adjustment between production and consumption.
 Enormous taxation.¹

In this same report are also listed various remedies suggested by business for that depression, some by no means unheard of today, such as—

Good judgment and hard work.
 Confidence.
 Check legislative derangement of the currency.
 Reduce the salaries of officers of the Government.
 Abolish all unnecessary offices of the Government.
 Rigid economy of the Government.
 Local self-government with no Federal interference.
 Enact laws against communistic schemes.
 Abolish taxation.
 Let Government give attention to the individual needs of its citizens.
 Elect men of better judgment to Congress.
 And, finally, restrict the powers of the President.²

Needless to say, the controversies raised by technology have not diminished since 1886, nor are they likely to in the future.

The term "technology" in its narrowest sense refers to changes in technical processes, the machinery, the plant, and equipment used by businessmen to manufacture and distribute their product. In the typical instance such changes increase the product per man-hour of labor or improve the quality. But there have been many increases in productivity due to factors other than changes in mechanical apparatus, notably improvements due to scientific management regularizing the flow of production, lowering costs, and the like. A change in floor plan providing a more even flow of raw materials, standardization of materials, a faster or more even flow of farm, factory, and mining products to markets, reducing inventories and lowering the cost of warehousing, improved factory lay-out and machine assembly, economies in the use of power, better selection of personnel with reduction of labor turn-over, time and motion studies reducing the effort required by labor to do specific tasks—all those come under the general heading of technology.

¹ *The First Annual Report of the Commissioner of Labor, Industrial Depressions*, March 1886, pp. 61-63.

² *Ibid.*, pp. 264-270.

Technology is consequently much broader than invention or even mechanical developments. Its sweep does not depend on the genius of single individuals. Its advance is like that of a tide, where no one wavelet is of more than transitory importance. Technical progress, like the building of a coral island, is the accumulation of the contribution of multitudes of individuals, capitalists, laborers, engineers, technicians, and scientists.

Changes in technical development are not haphazard. They are the results of the fundamental onward march of scientific knowledge. For innovation is a cumulative process, being usually a rearrangement or combination of earlier inventions and scientific discoveries. As the number of inventions increases, the number of possible permutations and combinations multiplies. This can only mean (barring catastrophes) that we are facing not the end of invention but, on the contrary, an acceleration of the rate of invention. It is entirely probable that we are today on the threshold of a greater period of technological advance than ever before in our history.

I have prepared an exhibit of innovations that are of major importance to industry. It by no means comprises a full list of scientific discoveries. For instance, none of the medical discoveries is listed. This exhibit shows in striking fashion the increase in the number of such innovations from before the tenth century on to the present day. For instance, there are only 3 items listed in the tenth century, four in the eleventh. But by the time we get to the eighteenth and nineteenth centuries the list of these innovations runs into pages.

I would like to offer this exhibit for the record.

The CHAIRMAN. Without objection, the exhibit may be received.

(The document referred to was marked "Exhibit No. 2428" and is included in the appendix on p. 17269.)

INVENTION OF THE ART OF INVENTION

Dr. KREPS. By far the most significant invention made in the nineteenth century was, as Dr. Alfred North Whitehead, the noted philosopher at Harvard University, has so well stated in his book, *Science and the Modern World*, the invention of the art of invention. Laymen who have no knowledge of the way in which inventions are made frequently labor under the delusion that inventions are happened upon by some lucky break, by some peculiar feat of genius, by some peculiar aptitude for contrivance or manipulation. And indeed this is the manner in which previous to the nineteenth century most inventions were actually made.

But after 1850 the progress of science, particularly of the physical sciences, became so systematized that the invention of a product was first blueprinted before realized by processes of deduction and synthesis in the industrial plant. Just as astronomers, by mathematical computations of the most complicated sort, insisted that there must be another planet in the heavens and later found Uranus, so chemistry, particularly after the promulgation by Kekule of his famous ring theory of the structure of carbon, developed the ability to produce almost any desired color and property simply by a knowledge of the architecture of matter. Thus the contact process for sulfuric acid started with elaborate mathematical computations because that was

the only practical way in which to find the one best set of conditions under which the synthesis of sulfuric acid by the contact process could be achieved. The most highly theoretical in modern times is in many cases the most eminently practical.

It is this technique of scientific blue printing by means of involved chemical and mathematical formulas which has made the industrial research laboratory the creator of new processes and new products, the critic of existing techniques; in short, the industrial and commercial intelligence section of a modern business. Industrial research laboratories today aren't places in which so-called contriving geniuses work. They are, rather, clusters of workers completely familiar with the most advanced scientific techniques of analysis who cooperatively explore the terrain which their theoretical compilations have shown to be most likely to produce results. Thus, in honoring the inventors of Nylon recently, the du Pont Co. asked that a group of 11 of their men share the award. Invention, in short, is a cooperative product, whether by international collaboration of scientists or by a program of industrial research financed by large corporations.

WHY ARE INNOVATIONS INTRODUCED?

Dr. KREPS. The primary purpose of businessmen in introducing new machinery or new methods is, of course, to reduce costs of production. That is first. The displacement of labor, while often a result, is seldom a motive or cause.

Labor cost is, of course, a highly important item, particularly so in the less-mechanized industries. But employers are interested in anything that will reduce any other expense on their books. In an article entitled *Invention and Discoveries*, Dr. S. C. Gilfillan examined a typical sample of inventions and found only a third to be labor-saving devices; 8 percent were land-saving, 14 percent were capital-saving, and 45 percent created new kinds of consumers' goods. Business welcomes new machines which economize fuel, power, and floor space more than those which reduce the expense of labor and of direct supervision. New machines may reduce one or more of any number of costs—costs of raw material, maintenance, repair, inventory. If so, they will in time be adopted.

But reduction in costs is not the only reason. New machines arouse pride and loyalty and efficiency in their workers. New machines promote cleanliness and safety in the shop, often make it fireproof. New machines may change the design or processing or precision of the product, making it more acceptable to the market. Machines are tireless, accurate, powerful, obedient, never talk back, and never go on strike.

Numerous as are the advantages offered by machine, they will never supplant human effort entirely. Machines may take over back-breaking, simple, repetitive work. But there are definite limitations. Even at the present time by far the larger proportion of American labor is not occupied with machines, nor is it likely to be displaced by them. There is a vast range of personal and professional services in which the machine assists the laborer but does not supplant him—barbering, medicine, and so forth. Even in the industries that are sometimes thought to be dominated by the machine, a careful survey made by Dr. Harry Jerome of the National Bureau of Economic

Research established the fact that in a representative group of plants embracing a variety of manufacturing industries 44 percent of the workers were hand workers even as late as 1925, 52 percent being machine workers, 3 percent being supervisors, and 1 percent being teamsters. The figures for individual industries are given in detail in this exhibit, which I submit herewith.

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit No. 2429" and is included in the appendix on p. 17276.)

Dr. KREPS. Note that at that time, even in bituminous coal mining, 82 percent of the workers were hand workers.

New machines easily arouse popular interest and attention. Hence, their importance is often exaggerated. But the process of mechanization is neither automatic nor inevitable. It depends on size and weight of the product, on the uniformity of raw materials, and on the degree of standardization possible, and the like. Adaptability to use of power and mechanical and chemical engineering processes is fundamental. The industry, the firm, the management, the technical labor force, and, above all, the customers, all vary in willingness to accept and ability profitably to employ technological advance.

Coming now to the second part of the testimony, the Economic Effects of Technology, some of the more important economic effects are given in the outline below. This outline, it should be observed, is in no way complete or exhaustive. It greatly oversimplifies the problem because there are so many currents and crosscurrents interacting simultaneously. There are short-run effects and long-run effects, interindustry and intraindustry repercussions. But the outline does indicate the important types of technological change. Mr. Chairman, I would like to put the outline directly into the record without reading it in detail.

The CHAIRMAN. You want it to appear as a part of your testimony at this point?

Dr. KREPS. Yes, sir.

The CHAIRMAN. Very well; it may be so ordered.

(The matter referred to follows:)

IMPORTANT TYPES OF TECHNOLOGICAL CHANGE

- | | |
|--|---|
| I. Inventions of a new product or service involving investment in new plant and new enterprise: | Representative Problems Raised. |
| A. If making a product or doing a job that would otherwise not exist: | |
| 1. Buoyancy of exploring a new market may enlarge business borrowing and with a "multiplier" effect increase the volume of production, consumption and employment: | Credit expansion.
Cyclical mal-investment. |
| (a) Rapidity and extent of success depends on economic conditions, on market resistance, on industrial controls, etc. | |
| (b) Often increases inter-industry and inter-commodity competition. | |
| 2. May cause fight for share in consumer dollar. | Mass persuasion. |

I—Continued.

B. If partly displacing an existing product or service:

1. Gives outlet for spirit of gain with new investment, employment and production, sometimes in new areas. Migration of industry.

2. Those making old product intensify efforts to survive. Abandoned plants.
Ghost towns.

II. Labor saving devices, especially those substituting machinery and mechanical power for labor:

A. Manifold effects will depend on whether, and the extent to which, net savings are passed on in one or more or all of the following ways:

1. To consumers in lower prices: a positive stimulus to increased consumption, production and higher standards of living: Large scale production.
Heavier fixed charges.

(a) Dollar volume of sales as large or larger:

(i). All the workers attached to the industry re-absorbed, e. g., lithographing. Occupational obsolescence.
Frictional unemployment.
Vocational retraining.

(ii). Consumers get more of same product; the economy gets stimulus of increased demand for raw materials, expanding output, etc.

(aa) Changes in consumer expenditure patterns.

(b) Dollar volume of sales less: Price disturbances.

(i). Consumers have more to spend on other things.

(ii). More volume, higher efficiency, more workers not only in other industries but in raw material, transport and distributive trades.

2. To labor in:

(a) Lighter work and better conditions:

(i). No change in number employed but wages may be lower. Women in industry.

(b). Fewer hours per day or per week. Child labor.

(i). If output per worker per day or per week remains the same, prices and production remain the same.

(aa) Fewer man-hours per unit of product—increased leisure. Education for leisure.

(bb) Shift of demand to some extent—home furnishings to automobiles and moving pictures. "Caprice" consumption.
Greater cyclical instability.

II—Continued.

- (ii): If output per worker per day rises—lower costs may mean lower prices with further results, same as under (a) above:
- (c) Higher money wages per hour:
 - (i) Shift in pattern of income distribution, if unemployed without income are included.
 - (ii) Larger proportion of productive resources absorbed in making comforts.
 - (iii) More vivid contrast between scale of living of laborers in low-wage, non-industrialized areas and high-wage areas.
- 3. To capital in higher profits on capital: Increased funds available for further expansion:
 - (a) If plowed back may increase:
 - (i) Concentration of production in few firms. Wastes of monopolistic competition.
 - (ii) Temptation to unwise expansion. Excessive capacity.
 - (iii) Importance in competition of length of purse. Inefficient financial Goliaths.
 - (b) If not re-invested may increase size of stagnant pools of savings to point where portion of income stream buying output of industry is too small at current prices. Restricted markets.
 - (c) Consumption of the "luxury" type.
 - (d) Investment decisions in few hands—problem of outlets. Idle money in banks and other lending institutions.

III. Capital-saving inventions.

A. Rationalization measures, i. e., changes in organization of production or labor, e. g., scientific management, Taylor system, Bedaux system, standardization, etc.

- 1. Existing firms may produce more without any rise in investment or employment.
- 2. Capital-labor ratio may rise, e. g., automatic looms, speeding up of spindles, higher speed of transport due to better roads and engines.

B. Labor- and cost-saving inventions in capital goods industries.

- 1. Not so much labor absorbed in industries producing machines. Men out of work.
- 2. Without change in volume of savings, problem of finding outlets for idle money is made more difficult. Low interest rates.
- 3. Usually old capital must be revalued by large write-downs or increased depreciation and obsolescence charges. Temptation to resist technological change.

Dr. KREPS. I intend merely then to call attention to the fact that there are three types of innovations here dealt with—I, those innovations which result in a new product or service involving investment in new plant or new enterprise; II, labor-saving innovations, especially those substituting machinery and mechanical power for labor; and finally, III, capital-saving innovations.

The CHAIRMAN. As I recall, earlier in your statement you quoted some student of technology as endeavoring to classify these various inventions as to percentages of each. Perhaps it would be well for you to repeat that statement here.

Dr. KREPS. In his sample he found only one-third to be labor-saving devices; that is, coming under II.

LABOR-SAVING DEVICES

The CHAIRMAN. That is, only one-third of all of the inventions or improvements of technology are labor-saving in character.

Dr. KREPS. In their direct operation.

The CHAIRMAN. And what percentage had the effect of establishing new industries or new plants, new enterprises or new products?

Dr. KREPS. Forty-five percent, as he listed them, created new kinds of consumer goods, some difference in the product which made it more salable, and in some cases entirely new products.

The CHAIRMAN. Was any attempt made to determine to what extent those new consumer goods were competitive with existing goods?

Dr. KREPS. He made no such attempt in his sample.

The CHAIRMAN. There is that phase of the problem; is there not?

Dr. KREPS. Yes; as I indicate under I, part 2, such innovations may cause a fight for a share of the consumer dollar, and therefore lead to the use of various devices of mass persuasion.

The CHAIRMAN. In other words, many of these new products are substitutes for old products.

Dr. KREPS. Quite so.

The CHAIRMAN. Rayon is a substitute, at least to some extent, for silk.

Dr. KREPS. Exactly.

The CHAIRMAN. Have you made any catalog of such substitutes?

Dr. KREPS. I have not.

The CHAIRMAN. Is any such catalog available?

Dr. KREPS. I know of none that is available. There have been given for individual products all the competitive commodities in the field, of course. I have, myself, in a book on sulfuric acid, indicated in a chapter the number of substitute commodities, a phenomenon that I call intercommodity competition, that tended to share the market with sulfuric acid.

The CHAIRMAN. Dr. Anderson, will any of the witnesses go into that phase of the subject?

Dr. ANDERSON. Yes, sir; it is a very difficult topic, as you know, sir, to get the interrelationship, but I hope that when we move into automobiles tomorrow we will directly concern ourselves with replacement and substitution of automobiles for other products, and in specific cases in that way we hope to bring them out in each successive day's hearings.

The CHAIRMAN. I was thinking rather of commodities like rayon, plastics, and the like.

Dr. ANDERSON. We have one hearing on textile fibers which will treat of that particular one, rayon, and its effect upon the entire textile market.

The CHAIRMAN. I think it might be very illuminating if some study was made of substitutes as a general subject.

HOW MEASURE THE IMPACT OF TECHNOLOGY?

Dr. KREPS. The first problem to which I want to return is the difficult one of how to measure the various changes caused by technology.

The impact of technology is not a simple one or a direct one. Prof. Frederick C. Mills of Columbia University spent more than 10 years directing a staff at the National Bureau of Economic Research in a study of this problem. He has published 3 large volumes of findings which will be heavily relied upon in these hearings. Yet he regards the job as by no means complete. In the National Research Project, Mr. David Weintraub has published more than 60 volumes, and of course one agency that has been assembling, studying, and publishing practically all the fundamental data that is available on this subject is our own Bureau of Labor Statistics. But as Dr. Mills has pointed out:

Technical change is a many-sided process that affects economic institutions in economic activities in numerous ways. The opportunities open to entrepreneurs; the flow of savings; the kind of capital goods required; the rate of obsolescence; the soundness of existing investments and of the debt structure that rests upon them; the amount of labor needed and the kind of skills required in the working force; costs and prices and the distribution of purchasing power—all these are directly affected by changes in productive technique. Moreover, the problems raised by technical changes may be quite different at different times and in different conjunctural conditions. It is a problem that calls for realistic, first hand study, that is both intensive (in its bearing on the fortunes of single industries and industrial groups) and extensive (in its bearing on the production structure as a whole and on the working of the price and credit systems).¹

Thus, to attempt to measure the amount or economic effects of technological change merely by taking, say, a given manufacturing industry and comparing output with number of men employed or man-hours worked at different times, say in 1870 or 1900 and 1929 or 1937, is not even to scratch the surface of the problem. Many more measurements are required. In addition to knowing (1) what has happened to physical volume of total production of all products and (2) what has happened to the production per worker and per man-hour of labor in all important branches of business, an adequate analysis requires measurements of such things as (3) primary power utilized both in total volume and in amount per employee; (4) number of workers employed; (5) fluctuations in unit prime cost; (6) money spent for industrial research; (7) number and importance of new manufacturing materials or new processes; (8) figures on wastage of manufacturing materials; (9) production of secondary materials such as scrap iron, rubber, copper, tin, and the like; (10) number of industrial accidents; (11) extent, degree, and quality of

¹ Frederick C. Mills, "Industrial Productivity and Prices," in *Journal of the American Statistical Association*, No. 198, Vol. 32, June 1937, pp. 247-248.

lighting and other factors necessary to 24 hour a day operation; (12) improvement in working conditions; (13) wholesale and retail prices of the articles manufactured; (14) percentage of new enterprises started per year; (15) hourly, weekly, and yearly wages, in money and in goods; (16) returns to the proprietorship account in dividends, interest, profits, or managerial salaries, and above all, the effects on other industries in the shape of interprocess, intercommodity, and interindustry competition.

It is obviously impossible to attempt to give even a fraction of the time and space necessary to an exhaustive analysis. One must pick and choose and that is exactly what I propose to do.

NEW INDUSTRIES CREATED BY TECHNOLOGY

DR. KREPS. I am first going to go into the question of what important new industries have been recently created by technology.

The most startling of all accomplishments of technology is that of creating entirely new products and doing jobs that otherwise would never be done at all. Without technology we would not have such marvels of engineering genius as the Hoover Dam, or Grand Coulee, or the Triborough Bridge. That work would not be done. Nor would we have such products as the radio, the automobile, the telephone, the railroad train, alloy steels, plastics, rayon, nylon, and the like. These and other new industries employ millions of workers.

A tabulation published by the National Industrial Conference Board in its interesting study on *Machinery, Employment, and Purchasing Power*, provides a good case in point. I should like to submit this exhibit for the record.

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit No. 2430" and is included in the appendix on p. 17276.)

DR. KREPS. It lists 18 industries that have been started in the United States since 1870 and now employ millions of men.

These are, of course, by no means all additional jobs. Even the automobile industry supplanted a large number of little enterprises that used to make wagons, buggies, harnesses, and other such equipment. Livery stables went out of business, and the farmer's market for oats, hay, and the like, in large part, vanished.

Moreover, all new inventions have to be bought and paid for, largely by consumers whose incomes have not been expanded.

Representative REECE. If you don't mind an interruption, do your figures on motor vehicles include the sales force, which would come more nearly being the phase of the industry which replaces livery stables?

DR. KREPS. This is the manufacturing end of the industry, not the automobile vehicle retailing. That is, this does not include garages, and so forth.

For consumers, the purchase of something new means going without something they formerly used to buy, if they haven't had an increase in income. It is said, for example, that the proportion of income spent for home furnishings and for clothing has been decreased by the demands upon the budget made by the automobile for gasoline, repairs, and the like.

Similar comments could be made on all the industries mentioned in the exhibit. Rayon has, in part, supplanted cotton and woolen fabrics, particularly those of high quality. Manufactured ice or mechanical refrigerators have supplanted the old-fashioned ice plant, and the like.

Now, in discussing the second type of innovation, the labor-saving innovation, one of the most important problems raised is, what happens to the laborers actually displaced?

The easy answer to this question is usually, "They are absorbed elsewhere," or "They are released for easy jobs in the clerical professions or in the service trades." This idea had a good deal of validity when work was plentiful as it was before 1890.

But as Dr. Mills writes in summarizing his studies:¹

A facile dismissal of the problem on the assumption that an automatic adjustment to industrial shifts is effected, with re-employment of all displaced productive factors, is no longer possible.

DISTRESS TO LABORERS CAUSED BY MACHINES

Mr. HINRICHS. May I interrupt at that point a moment, Dr. Kreps? You say that reabsorption from the displacement that occurred was relatively simple with rapid expansion. Can you cite evidence to that effect, and how do you reconcile that statement with the character of the machine riots which were possibly commoner in the nineteenth century than they are today?

Dr. KREPS. The machine riots owe a good deal of their intensity at that time to the fact that the machine was something absolutely new, and they had a good deal more public support in resisting it than they can get today when we are accustomed to technological changes.

Furthermore, we have made adjustments today which were not made at that time; since the machine was relatively new in Great Britain, they had not yet developed the various devices for facilitating the transfer of labor and its employment in other industries that we have developed in modern times.

My point is simply that when you have, as you did to begin with, an innovation, say, merely in the textile industry, and your economy is still 90 percent agricultural, as even ours was in 1790, the amount of displacement the machine causes is relatively small; but when you have become, as we have in recent years, more than 60 percent industrialized, and you get machine technology, innovations going on in range after range of enterprise, your problem greatly increases.

Mr. HINRICHS. Your statement in all events isn't based on any studies that were made in that earlier period, tracing through what did happen to particular groups of displaced workers. For example, one of the major displacements was the displacement of the home weaver by machine weaving, and when we come down to date, we have actually traced through what happens to some of the individuals, as Mr. Weintraub did, for example, with silk weavers displaced, with some knitters that had been displaced in Philadelphia. We don't have any materials that you know of in the nineteenth century that give a contrasting picture of an easy transition at that time as against the difficult transition at this time with the individual worker displaced.

¹ "Industrial Productivity and Prices," *Journal of the American Statistical Association*, June 1937, No. 198, Vol. 32, p. 247.

Dr. KREPS. Coming back again to the United States—and I am talking primarily about the problem here—I think the picture which de Tocqueville gives us of the United States in 1820 indicates rather clearly whatever displacement took place was readily compensated for; there were places, frankly, where laborers could go. It is quite true that in Great Britain such studies as Hammond's *The Village Labourer* and *The Town Labourer*.¹ Thomas Hood's famous poem, *The Song of the Shirt*, and others, indicate that there was localized distress of a very acute sort. Nonetheless, so far as the economy as a whole is concerned, I don't believe the problem had nearly the magnitude, certainly in the United States, at that time that it has now.

Mr. HINRICHS. I don't want to push the point further, but there is a difference between the effect on the economy as a whole and the effect on particular workers. We may want to develop that somewhat later.

Dr. KREPS. Quite so.

The CHAIRMAN. That difference is apparent throughout the whole history of the development of technology, isn't it, the effect upon the economy as a whole and the effect upon particular workers?

Mr. HINRICHS. I think that the problem of the relationship with the machine in detail to particular individuals and groups of individuals is of fundamental and overwhelming importance, and it may possibly be somewhat confused in discussions of the effects on the general economy. I know of no evidence to indicate the fact that the problem of individual displacement has not been a very acute one. Whenever a major innovation has been introduced the evidence of the nineteenth century in general economic literature seems to me to indicate that effect on the individual was present, was very terrific at that time, and was handled at that time with possibly less social consciousness and awareness of the problem than I should hope would be present in our handling of that problem at the present time.

Dr. KREPS. Certainly, beneficial as the machines in the aggregate have been in lightening the work of labor and in increasing the amount of available product, and even granting that in the long run labor manages to find other employment, the question still remains why those who can least bear the burden are required to make the sacrifices demanded of them by the machine. On this point the Industrial Commission, composed mostly of McKinley Republicans, stated 40 years ago in its report:

The interest of the man who sees a machine invading his craft and threatening to rob him of the opportunity to sell his skill is little affected by the results which the introduction of the machine may exert 20 years hence upon society, upon his trade, or even upon his children. He is concerned with getting bread and shelter today and tomorrow.²

And they go on to say:

From the social standpoint, justice might also seem to require compensation for the destruction of the value of special skill. When a man has devoted years to the acquirement of an ability, he may be excused for feeling that he has a vested right in his income from the use of it. This feeling, indeed, is at the bottom of the machine-breaking and the other less violent means by which men

¹ John L. Hammond, *The Village Labourer*, 1760-1832 Longman's, 1917. *The Town Labourer*, 1760-1832 Longman's, 1920.

² *Final Report of the Industrial Commission*, House Document No. 380, 57th Congress, 1st Session, p. 822.

have undertaken to maintain their hold on work which they have felt belonged to them.¹

Of more than usual interest is the recommendation of this Industrial Commission that—

* * * the only way in which the workmen in a particular trade can, by their own action, avoid the immediate hardship that results from improvement of machinery and methods in their own craft seems to be by united action, taken through some such organization as a trade union. It is believed to be impossible to point out any instance in which unorganized workmen have received any immediate and visible benefit from the introduction of new machinery in their trade.²

The problems of isolating such temporary technological unemployment from other kinds of unemployment is a difficult one. That accounts, of course, Mr. Hinrichs, for the lack of studies until a comparatively recent date. It is mixed up with various other forms of unemployment: Workers who have lost their employment on account of seasonal influences, cyclical unemployment, unemployment as the result of a change in the age composition of the population or overcrowding in certain branches of the labor market, for example, the middle classes of women workers, and so-called frictional employment which represents the reserve supply on the labor market.

Recently some notable sample studies have appeared, among them that of Dr. Isador Lubin, of this committee, entitled *The Absorption of the Unemployed by American Industry* (published by the Brookings Institution, pamphlet series vol. I, No. 3). In his sample of displaced workers less than a third of those who found jobs returned to their old industries, the rest being unemployed for as much as a year before they found work.

Another study by Dr. E. Wight Bakke followed certain displaced Hartford rubber workers.³ During the first year the skilled workers lost 4.8 months of work, the unskilled 4.6 months. The annual incomes of the former group fell to 50 percent of what they had earned in 1928, the latter to 62 percent. In the third year following the shut-down, not only were the relative losses of the skilled greater than those of the unskilled, but the absolute average annual incomes were lower. As Dr. Bakke says:

Apparently the qualities which helped men to rise to skilled jobs and high wages while at work are of limited use in helping to readjust satisfactorily when the job goes.

It is not necessary to refer to the excellent and graphic studies of the National Research Project, nor to call to mind *The Grapes of Wrath* of John Steinbeck, to emphasize the hardships suffered by those who are displaced today, even by those who are "tractored out" on a farm.

PRODUCTIVITY OF LABOR

DR. KREPS. The next question I want to raise is: How has technology affected labor's ability to produce? The effect of machinery upon the average amount produced by the American worker in the manufacturing industries is strikingly shown in a chart entitled

¹*Ibid.*, p. 824.

²*Ibid.*, p. 825.

³E. W. Bakke, *Former L. Candee Workers in the Depression*, Yale University Press, New Haven, 1934.

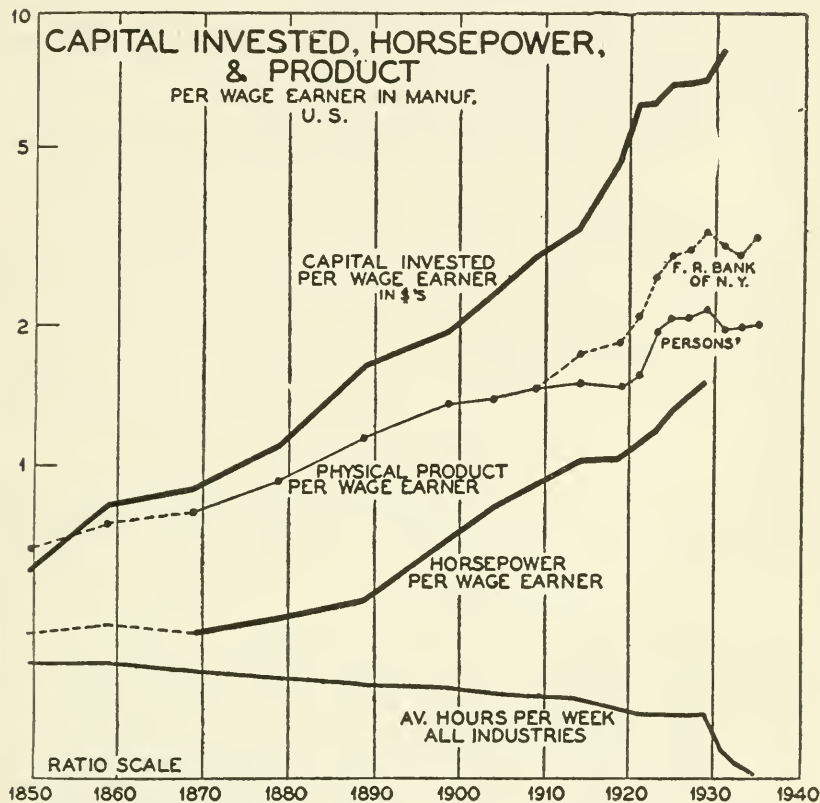
"Capital Invested, Horsepower, and Product," taken from Carl Snyder's book, *Capitalism the Creator*.¹

I would like to submit this chart as an exhibit.

The CHAIRMAN. The chart may be received.

(The chart referred to was marked "Exhibit No. 2431" and appears below.)

EXHIBIT No. 2431



XXVII. THE CAPITAL INVESTMENT AND THE WAGE OF THE WORKER

Dr. KREPS. You will note that the physical product per worker since 1870 has more than doubled. There has been a striking increase in the capital invested per wage earner in dollars and in the horsepower per wage earner. Meanwhile the average hours of work per week in all industries have dropped from levels of around 60 and 70 in 1870 to the 40-hour week at the present time.

The CHAIRMAN. Does that appear on this chart?

Dr. KREPS. You have to read it at the bottom.

The CHAIRMAN. Oh, yes; the lower line shows the trend of the average hours per week in all industry.

Dr. KREPS. That is right.

¹ Carl Snyder, *Capitalism the Creator*, MacMillan, 1940.

The CHAIRMAN. What is the source from which these figures were taken?

Dr. KREPS. Dr. Snyder, who is an economist for the Federal Reserve Bank of New York, had a vast array of statistical data and they have been pieced together from that array. To quote all the sources would absorb considerable time, but he is a rather competent statistician, and therefore I have taken it from him.

The CHAIRMAN. The heavy black line at the top indicates that there has been a tremendous increase in capital investment as related to the dollar wages of the worker. Is that correct?

Dr. KREPS. That is correct.

The CHAIRMAN. And that, of course, reflects, I take it, the increased cost of plant under modern technological change. Is that correct?

Dr. KREPS. There is a dispute on that point. The statistics do not speak with one voice.

The CHAIRMAN. What is the explanation, then, of the increased investment?

Dr. KREPS. First of all, the increased investment is in dollar figures.

The CHAIRMAN. Is in what?

Dr. KREPS. In dollar figures, and there is no good way of deflating dollar figures of capital invested for changes, for example, in the general price level.

Senator KING. We know that a great deal of machinery has been obsolete, characterized as obsolescent, which has called for very large capital investments in order to replace the displaced machinery and to keep up with the demand for the new products and the demand of the market for the products.

INCREASED CAPITAL PER UNIT OF PRODUCT

Dr. KREPS. The point that I think the Senator was raising was the one whether or not the amount of capital per worker, or rather per unit of product per worker, had tended to increase. We have to get back to the dollar figures, and as soon as we do that we feel that certainly the amount of capital kept up with product; in other words, there was what we call an intensive application of capital up to 1910. Since 1910, and particularly since 1925, there seem to have been certain changes introduced which made it possible to make more product with less dollar investment of capital; in other words, innovations have made it possible for a machine costing less money to do as much or more work than the old machine; we have improved the design and the effectiveness of our machinery, and it is on that second point that at the present time the statistics do not speak absolutely clearly, although they do since 1925.

The CHAIRMAN. Then what is, in simple words, the significance of this first line, this upper line?

Dr. KREPS. To indicate two facts, and Dr. Snyder, I think, has indicated them in his footnote: That the amount of increase in product per worker is largely due to increased machinery, and increased horsepower in that machinery, put at the worker's disposal, and that that larger volume of machinery in turn has been due to business-

men taking their savings and placing them in capital equipment at the disposal of society. That is at least what I take it this chart represents, and that is the meaning I wished to convey.

The CHAIRMAN. Doesn't that mean increased investment in plant and equipment?

Dr. KREPS. Oh, quite, an absolute increase, positively. I had interpreted your question as being one in which you wanted to know whether the increase was more rapid than the increase in physical product.

Senator KING. It was only a few years ago Mr. Ford discarded machinery and plants that were worth more than 50 to 65 millions of dollars, and the larger part of his capital now consists of plants which of course deteriorate from day to day and from year to year and call for increased investment.

Dr. KREPS. That is right.

Mr. HINRICHS. Mr. Chairman, in connection with this chart and merely to clarify the record, I would like to comment on that bottom line for a moment. This chart is constructed on a ratio scale and that means that the base line of the chart is not a zero line; that is, obviously hours per week have not gone down to almost zero, but effectively that bottom line as far as hours is concerned would represent about 38 hours a week at the present time, and back in 1929 it would have represented some 44 hours.

SHORTENED WORKING HOURS

Dr. KREPS. The point that I wanted to make in connection with that chart which slightly exaggerates the movement in hours is that there had been a declining trend throughout our earlier history. Our figures in the Bureau of Labor Statistics would indicate that between 1909 and 1929, let us say, hours were fairly substantially decreased, not as much as they have been decreased from 1929 to 1939, but the rate at which hours were shortened was not more than twice as great in this latter period as in the earlier period, and this chart, merely from the point of view of the record and from that single point of view, slightly exaggerates the movement that has taken place; it has not been quite as extraordinary a movement as it might seem to be in this ratio plotting. That was a period of unusually rapid and unusually concentrated change in hours worked. Since 1933, since 1932 as a matter of fact, there has been relatively little change in hours worked. Actually they tend now to be longer than they were in 1932. If you contrast the rate of change between 1929 and 1932 you have an exceptional and extraordinary change in hours worked. If you consider the 10-year decade as a whole, the shortening of hours is much less exceptional than it might appear to have been on the basis of this chart.

I think I can explain, Senator, that what Mr. Hinrichs is saying is perfectly true, namely, that a reduction, say, of 6 hours per week when you start from 60, is only a 10-percent reduction; that same reduction taken from, say, 30 hours a week, is a 20 percent reduction. Therefore, a chart of this order visually, particularly in that last period, would exaggerate the amount of decline.

Mr. PIKE. On the other hand, it dampens the upward movements, too.

Dr. KREPS. Yes; it does that.

Dr. WALKER. Would you explain exactly what that top line, capital invested, means?

Dr. KREPS. Dr. Snyder has taken this with certain modifications of his own from the successive censuses of manufacture plus a series that is kept up since 1920, I believe, by the Federal Reserve Bank of New York.

Dr. WALKER. Does it mean plant or all assets?

Dr. KREPS. It does mean all capital invested; it does not mean just fixed capital.

Dr. WALKER. It would be different if there were changes in the ratio.

Dr. KREPS. If there had been any substantial change in the ratio of inventories to fixed capital.

Representative REECE. What would be the effect of that top line representing capital invested, if it were based upon the wage-earner hour rather than upon the wage earned? The difference would be much greater, would it not?

Dr. KREPS. That is true. Of course in modern times plants are tending to operate on a more uniform basis, that is they will tend to operate, say 2 shifts, 16 hours; an intensive use of their capital, in other words, is taking place, so that you get a modified effect.

While Dr. Snyder's chart exhibits the rate of growth from 1870 to 1930, the chart which is found in a publication issued this morning by the Brookings Institution, written by Dr. Spurgeon Bell, entitled *Productivity, Wages and National Income*, shows the story in detail for the last 24 years for manufacturing enterprise. I should like to offer this chart for the record.

The CHAIRMAN. The exhibit may be received.

(The chart referred to was marked "Exhibit No. 2432" and appears on p. 16227.)

Dr. KREPS. Notice there that the volume of production in manufacturing has increased more in that period than the amount of fixed capital invested. (This is fixed capital only.) In other words, the productivity of capital has increased. In 1936-37, fixed capital investment was only 2 percent greater than in '23-24; the volume of output was 25 percent greater.

The steady decline in total man-hours of employment is also striking. In general, the productivity of labor seems to have increased by something on the order of 40 percent from 1924 to '38.

The CHAIRMAN. Would you mind making a comment on the background of Dr. Bell?

Dr. KREPS. Dr. Bell is a statistician who for a long time was at Ohio State University and then has been with the Brookings Institution for the last year, getting together these figures.

The CHAIRMAN. This chart represents the statistics which he has gathered while a member of the staff of the Brookings Institution?

Dr. KREPS. Quite so.

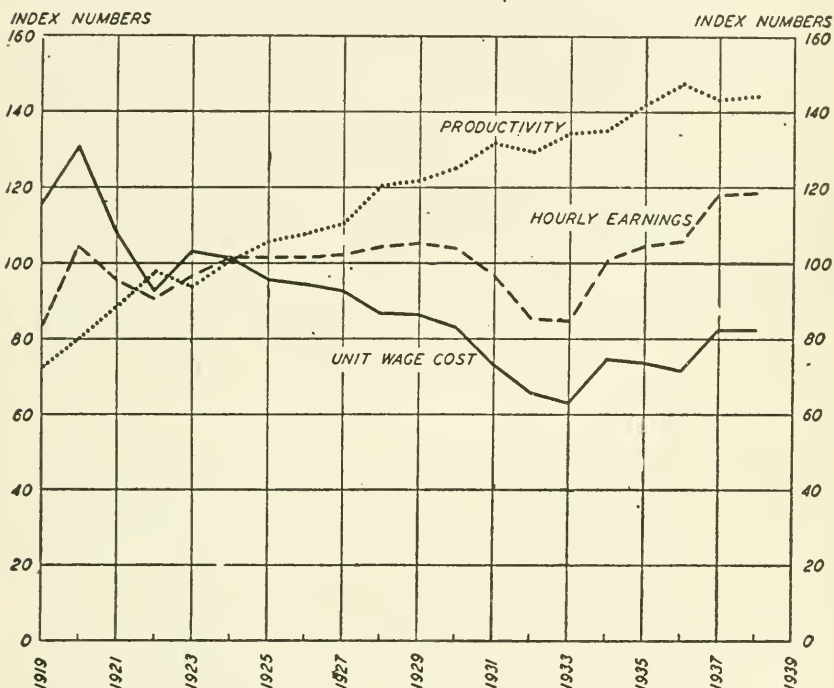
In this same volume, Dr. Bell presents a series of charts, all of them showing this same trend. This is the general pattern.

The CHAIRMAN. This upper chart would indicate that there has been not only a positive gain in the number of wage earners since 1932 until 1937, when it began to fall off, but that there has been a marked gain of wage earners as compared to the amount of fixed capital.

Dr. KREPS. That is correct.

EXHIBIT No. 2432

PRODUCTIVITY, HOURLY EARNINGS, AND UNIT WAGE COST IN
MANUFACTURING, 1919-38^a
(1923-25 = 100)



Source: Spurgeon Bell, Productivity, Wages and National Income (Brookings Institution: 1940)

The CHAIRMAN. That is, while fixed capital was falling off generally during that period, the number of wage earners was steadily increasing.

Dr. KREPS. That is correct. That tendency is present as one of the most significant tendencies, I think, since after the World War, since 1920.

The CHAIRMAN. What is the explanation of that in terms of technology?

Dr. KREPS. I offer some explanation of it. I am not quite sure—

The CHAIRMAN. (interposing). As you go along?

Dr. KREPS. Yes.

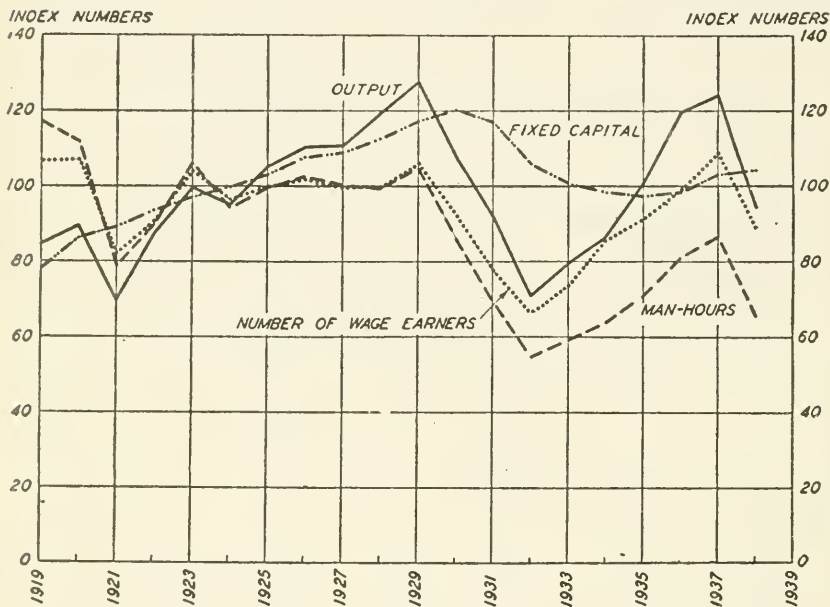
The CHAIRMAN. Very well.

(The chart, referred to was marked "Exhibit No. 2433" and appears below.)

Dr. KREPS. I may say this same picture holds true for many other industries. Fixed capital investment, for instance, has either fallen off in the automobile, textile, iron and steel, and manufacturing industries, or failed to increase as fast as output.

EXHIBIT No. 2433

FIXED CAPITAL INVESTMENT, OUTPUT, AND EMPLOYMENT IN
MANUFACTURING, 1919-38^a
(1923-25 = 100)



Source: Spurgeon Bell, *Productivity, Wages, and National Income* (Brookings Institution, 1940)

Employment and man-hours of labor also fail to keep pace with output, in most cases actually declining. Productivity shows a continuous increase over the entire period—no break in trend at any particular date. These phenomena, while I am showing them in this exhibit only for manufacturing, I can say from the book also are true for mining, railroads, electric light and power, and individual industries, such as automobiles, iron and steel, paper and pulp, cotton textiles, and tobacco.

A table summarizing some of these results has been compiled from his volume and I wish to submit it as "Exhibit No. 2434, Productivity, Output, and Employment; Percentage Changes Between Designated Years, in Major Groups of Industries and in Selected Manufacturing Industries."

The CHAIRMAN. The table may be received.

(The table referred to was marked "Exhibit No. 2434" and is included in the appendix on p. 17277.)

Mr. HINRICHs. You said that there was no break in this series on productivity.

Dr. KREPs. No break in the trend.

Mr. HINRICHs. I am not questioning your generalization, your characterizing that whole period, but there is a minor variation in there that I would like to point out and emphasize for just a moment, if I may. You will notice that in your chart between 1931 and 1932 your line stops rising.

The CHAIRMAN. Which chart are you referring to?

Mr. HINRICHs. I am referring to the chart entitled "Productivity, Hourly Earnings, and Unit Wage Costs."¹ That upper line marked "Productivity" shows a dip in that period from 1931 to 1932 which we think, in the work that we have been doing analyzing productivity, is rather significant, not so much in terms of the average for all manufacturing as more particularly in the components of manufacturing that caused the general line to stop rising. There were certain lines of manufacturing, notably in the heavy industries, in which productivity went down very sharply and will go down very sharply every time the volume of physical production declines. One of the characteristics of a depression is the tendency of the output per worker per hour to go down, which in large measure may offset the benefits of reduced labor costs that people seek to achieve through wage reductions in a period of depression such as we knew between 1931 and 1932.

THE MINING INDUSTRY

Dr. KREPs. I call attention to the fact that in this table, which gives the same picture for a variety of enterprise generally, the same trends appear. Employment in the mining industry and in railroads showed an absolute decline in the period of 1923 to 1929. Moreover, in that period volume of output increased 27 percent in manufacturing, while the number of wage earners increased only 2.8 percent.

An indication of the steadiness of the trend both in the twenties and in the thirties—and I am taking the decades and not particular years—is indicated in this tabulation, which shows productivity and unit wage cost for a variety of industries. I should like to submit this tabulation as an exhibit.

The CHAIRMAN. The tabulation may be received.

(The table referred to was marked "Exhibit No. 2435" and is included in the appendix on p. 17278.)

Dr. KREPs. By 1938 the productivity of labor had increased over 1923-25 levels by 44 percent in manufacture, 44 percent in railroads, 99 percent in mineral industries, 116 percent in electric light and power, 40 percent in automobile and parts manufacturing, 51 percent in blast furnaces, steel works, and rolling mills, 55 percent in paper and pulp manufacture, 38 percent in cotton textile manufactures, and 153 percent in the manufacture of tobacco products.

¹ See "Exhibit No. 2432," supra, p. 16227.

At the same time unit wage costs in 1938, compared with the base period of 1923-25, had declined 17.5 percent in manufacturing in general, the same for railroads, 46 percent for the mineral industries, 37.5 percent in electric light and power, about 7 percent in the automobile industry, 6 percent in the steel industry, 25 percent in paper and pulp manufacturing, 22 percent in cotton textile manufacture, and more than 50 percent in the tobacco industry. In all these industries, despite the increases in wage rates per hour, actual wage costs declined throughout the period. That is the sort of achievement which the machine makes possible.

Output per man-hour and per wage earner have increased considerably even since 1929. Various estimates place the amount in the vicinity of 25 to 30 percent. The detailed studies made by the National Research Project indicate that out of 67 industries 23 showed appreciable increases in production, 20 exhibited increases in employment, but only in 2 of them, the side and upholstery leather and the rayon industry, was there an increase in the man-hours of work.

I should like to submit this particular exhibit, taken from the National Research Project, showing what has happened to productivity, employment, and production in 59 manufacturing industries from 1929 to 1936.

The CHAIRMAN. It may be received.

(The table referred to was marked "Exhibit No. 2436" and is included in the appendix on pp. 17279-17281.)

The CHAIRMAN. All this material seems to show in a very definite and clear manner that in terms of wage cost the output is increasing tremendously.

Dr. KREPS. That is correct. Wage costs have been going down.

The CHAIRMAN. That trend is apparently a continuous trend.

Dr. KREPS. It has been in this period, with, as you will notice, some modification in individual industries, of course.

The CHAIRMAN. You say that that is a result of the machine.

Dr. KREPS. A result—I used the machine in an elliptical sense for technology, a result of improved methods of manufacture.

The CHAIRMAN. Is there any dispute about that?

Dr. KREPS. I know of none.

The CHAIRMAN. Do you know of any contrary statement or conclusion reached by any student?

Dr. KREPS. Not within the range of my information.

The CHAIRMAN. Have you heard of any statistics that indicate a contrary result?

Dr. KREPS. I have not.

The CHAIRMAN. One of these charts refers particularly to manufacturing, railways, mineral industries, and electric light and power. That pretty well covers the field of technological production, does it not?

Dr. KREPS. Dr. Bell estimates that 75 percent of the total employment is comprised within the sample of industries for which these figures are here given.

The CHAIRMAN. And while this technological advance has been going on in industry there has also been technological advance in agriculture, has there not?

Dr. KREPS. Quite so.

The CHAIRMAN. Have you covered that?

Dr. KREPS. I do not in my testimony, although we have hearings scheduled on the problem.

Dr. ANDERSON. Mr. Chairman, we have a 2-day hearing scheduled for agriculture, in which we will show the results of about a 3-year study that has been engaging the attention of the Department of Agriculture on mechanization in agriculture, which shows exactly the same tendency.¹

Mr. HINRICHS. When you used the phrase "three-quarters of industry," you were defining it as productive industries? You didn't include retail trade and service industries?

Dr. KREPS. No.

Mr. HINRICHS. Nor banking and finance and the other sources of employment which are rather large?

Dr. KREPS. That is true.

As you notice here, output per man-hour increased in all but 13 industries and declined in only 4 of them. The increase has ranged as high as 241 percent for rayon, in 8 industries they were in excess of 50 percent, and in 22 others range from 25 percent to 50 percent. Such is the magnitude of the technological advance in the midst of which we now find ourselves.

This tendency, it should be noted, is not peculiar to the United States. While I do not want to bring in an embarrassing volume of statistics, studies conducted by the International Labour Office and other research organizations show similar increases in productivity—not of the same magnitude, but increases, nonetheless—in England, France, Germany, and as a matter of fact throughout the modern industrial world. There is one computation for Great Britain which estimates that the same volume of output could be produced in 1934 as was produced in 1926, with 1,500,000 fewer workers than they had used 8 years previous.

THE NATIONAL LABOR FORCE

Dr. KREPS. Now I want to take up the question, how has technology changed the occupations of our national labor force?

As we have already noted, in the last 70 years technology has created hundreds of new kinds of jobs and required many new skills. It has also changed completely the number of workers in various groups of occupations.

I should like to submit as an exhibit a table taken from Dr. Bell's work showing occupational distribution of gainful workers from 1880 to 1939. These are in terms of percentages of all gainful workers. Notice that wage earners, since 1880, have comprised between 54 percent to 56 percent of all gainful workers, no great rise, and even an appreciable fall since 1910. The percentage of clerical and sales employees has about tripled, from 6.5 percent in 1880 to 18.3 percent in 1939. While the percentage of professional employees has doubled, it is still only 5.6 percent, and managerial employees 3 percent.

The CHAIRMAN. It may be received.

¹ See pp 16922-16999.

(The table referred to was marked "Exhibit No. 2437" and is included in the appendix on p. 17281.)

Dr. KREPS. The percentage of gainful workers in self-employed enterprises has steadily declined from 36.9 percent in 1870 to 18.8 percent in 1939, although the decline is considerably less in the last 10 years than in any previous decade. The percentage among farmers has dropped more than half, from 27.8 in 1880 to 11.8 in 1939, while that in nonfarm business enterprises has declined from 8 to 6.6 in 1930, and 6.1 in 1939.

I should add that different technicians in this field get somewhat different technical results. This is a happy hunting ground of experts on vital and occupational statistics.

In order to provide some technical footing of our own, with the usual reservations, I would like to submit a small technical memorandum entitled "Population and Employment, 1870-1940," which has data that have been carefully compiled in a volume which will be published—it is not yet off the press—by Dr. H. Dewey Anderson and Percy E. Davidson, Stanford University. The publication is called *Occupational Trends*. All these figures, as all of you know, have to start with population statistics, then make some estimates about the number of gainful workers, at least intercensal, although there are census records at the end of each decade, and from that come to certain conclusions about the working force, and what it is doing.

I would like to call attention to two or three charts in this exhibit.

The CHAIRMAN. You are submitting this in advance of publication?

Dr. KREPS. With the consent of the authors and publishers.

The CHAIRMAN. May I ask Dr. Anderson the source of the figures?

Dr. ANDERSON. Mr. Chairman, the first chart is a basic chart built from data that have been introduced in this committee before, in the economic prologue discussion,¹ the chart with respect to population and its movement. Its recharting brings out certain facts with respect to movement.

All of the charts carry sources on them, I think, that are descriptive of them in each instance.

With respect to the population figures themselves, they are taken from the census, and regroupings were made by a technical staff at the university. They have been subjected to rigorous criticism by other experts in the field.

The CHAIRMAN. That is to say, they were submitted for comment to other students before publication?

Dr. ANDERSON. That is right. For each chapter of the book from which this has been taken, we made up a panel of the people considered most competent in the field, and submitted the data of the chapter, including the figures, to them for comment before they were finally revised for publication.

The CHAIRMAN. I notice that there are some statistics taken from *Enterprise and Social Progress* as published by the National Industrial Conference Board.

Dr. ANDERSON. That is right.

¹ See Hearings, Part I.

The CHAIRMAN. Did that board have anything to do with the preparation of any of the other material?

Dr. ANDERSON. No; nothing whatsoever.

Dr. KREPS. I would like to call attention to two or three points in these charts, first "Exhibit No. 2438-A", "Growth of Population of the United States." Population, of course, is continuing to grow and will do so, particularly in certain age groups. The rate of growth since 1860, as you notice, has become steadily less. That ought to solve certain controversies about what is meant when people talk about declining population.

I would also like to point out in the next chart that we have on our hands in this next decade a greater problem of finding jobs for youth than we have had certainly in the past, and that we will have thereafter. In other words, the percentage of the new entrants is larger for that decade than in any of the previous ones.

The CHAIRMAN. If the percentage of population increase is steadily growing less, as indicated by "Exhibit No. 2438-A," is it not a proper deduction that the problem will rather be one of providing for the aged before the youth?

PROBLEM OF THE AGED

Dr. KREPS. That was the next comment I was going to make, that after this decade of the forties, we are going to have increasing problems with the aged. The number of workers from 45 to 64 years of age is increasing rapidly percentagewise, and finding jobs for men over 40 will in the near future require every scrap of ingenuity that leaders in business and Government can summon.

I would like to submit this whole exhibit for the record. It will be referred to probably many times.

The CHAIRMAN. Without objection, the memorandum will be received.

(The documents referred to were marked "Exhibits Nos. 2438 and 2438-A to 2438-O" and are included in the appendix on pp. 17281 to 17299.)

Dr. ANDERSON. I would like to point out in connection with comments with respect to age groups, that the table supporting the chart shows that a very substantial number of persons are to be found among the youth population entering labor, so that would be a continuing problem, although to a lesser degree of intensity.

The CHAIRMAN. Let's refer to "Exhibit No. 2438-C."

Dr. ANDERSON. The table 2438-C supports the chart. It is an important point to make because we are dealing not only with percentage of decrease and increase but actual numbers. It is an individual's concern that must be faced, and if you will note the figures, while they do show a downward trend of the youth population entering labor, as a matter of fact, the number of individuals concerned is quite large in each decennial period until 1980, there are 6,633,000 people in that population.

The CHAIRMAN. As I glance now at "Exhibit 2438-C," isn't there an apparent error there in the figures for new entrance to labor for

1950? That is represented as a positive increase of 0.9 percent, whereas the figures show a decrease under 1940.

Dr. KREPS. There is an error in transcription, you are correct, sir. It should be a minus 0.9.

The CHAIRMAN. It should be a minus. Let that change appear in the record.

Are there any others? Perhaps you had better run over that.

Dr. ANDERSON. No; there are no others.

The CHAIRMAN. Strange how my eye picked out the only one.

Dr. ANDERSON. Thank you so much.

Mr. HINRICHS. This table is headed "Estimated labor force of the future in the United States." The next to the last column of the table is headed "Totals, 20-64 years of age." You are, therefore, referring to the estimated labor force of the United States less than 64 years of age and not to the total labor force.

Dr. ANDERSON. That is right.

Mr. HINRICHS. There is a fairly substantial working group 15 to 19 years of age, many of whom make their entrance at that period, so that the definition in the first column, "New entrants to the labor force," doesn't mean that that group is necessarily making its first appearance, but that you regard them as unstably employed until they are 20 years of age, and still you do regard them as workers.

Dr. ANDERSON. That is right. The last column shows what proportion this population is of the estimated entire working population 10 years of age and over. So there is a substantial number of persons above 64 years of age, and below 20 years of age, who normally seek gainful employment. The assumption under which the table is made was that by one means or another, legislative, educational, old-age pension, and other forces, this group at the top and the group at the bottom would not enter the labor market.

The CHAIRMAN. I wonder, Dr. Hinrichs, if the Bureau of Labor Statistics has made any effort to check these figures of the National Industrial Conference Board.

THE POTENTIAL WORKING FORCE

Mr. HINRICHS. We are very much concerned in studies of the potential working force; particularly in connection with our occupational outlook service we are working on this question of labor supply. At the present moment the problem of estimating the percentages in each group, particularly as it applies to family population is extremely difficult. The last fundamental information that we have relates to the 1930 census. The 1940 census is going to show some very great differences in the percentage of the population who are ordinarily working, but this is a vital field in which we are working, yes.

The CHAIRMAN. Did not the unemployment census which was taken a couple of years ago develop any substantial statistics on this question?

Mr. HINRICHS. That, unfortunately, was not fundamentally a census, but a voluntary registration, a so-called sample enumeration was hitched onto that registration and gave us a sample census, but since it was incidental to the registration and was a mere means of

checking on the registration. it raised perhaps as many questions as it answered. It did throw some light on the question, and it indicates what was at the time an unbelievable increase in the proportion of women, particularly above 25 years of age, who continued to remain in the labor market. The 1940 census has been worked out with the utmost care in the light of the information that was developed in 1937, and I think is going to give us a more reliable estimating base than we can derive from the 1937 sample enumeration.

The CHAIRMAN. You refer to an unbelievable increase in the number of women above 25 who remain in the labor market. Why do you so characterize it?

Mr. HINRICHs. Well, I should say, myself, an increase which many people did not, cannot, believe took place.

The CHAIRMAN. In other words, you think the indicated result is not actually representative of the facts.

Mr. HINRICHs. The doubt arises for this reason: It is very difficult during a period of extensive unemployment to phrase questions with reference to the status of the worker clearly enough so that you don't do one of two things. You may unduly limit your concept of people wanting jobs and seeking work. I can illustrate that by saying that if you insist that a person has to be actively hunting for a job to be counted as unemployed, you don't make sense when you come into a community with a single mine or manufacturing enterprise that is closed down, where the workers will hunt work as soon as the whistle blows, but as long as the plant or the mine is totally closed down there is nothing to hunt and everybody in the community knows it.

Therefore, if you make your definition extremely rigorous with reference to the activity of the individual hunting a job, you tend to underestimate the magnitude of your problem. If, on the other hand, you define your question very loosely as one of wanting work, you may stimulate respondents to say yes, they do want work. The best example of that sort of thing—

The CHAIRMAN (interposing). Though they don't need it.

Mr. HINRICHs. I regard any person who is actively interested in having a job as needing a job. A job is not only a means of maintaining income, it is also a means of maintaining an individual's self-respect. In most instances there is a very close corollary between wanting a job for economic reasons and wanting a job in order to be at home in the society in which the man or woman is living.

Need, so far as I am concerned, narrowly defined, isn't a relevant criterion to the question, "Is a person employed or unemployed?" It is relevant if you are asking, "Does this particular unemployed person need underwriting by the public because he doesn't have a job?" Some people, some of the unemployed, come in that category; others do not.

To just take the other extreme that I am talking about, an over-registration of a desire for work, you have a large number of people who are in and out of the labor market. The group in the cities that come in for the Christmas retail trade are perhaps the best example—a very important source of income to them, but many of

these people do not normally count upon working throughout the entire year.

Now, a woman who normally works at Christmas time and not during the rest of the year goes through a period of transition between the time in, let's say, September, when she is definitely not in the labor market, to December, when she is actually employed. There comes a period just before her employment when she certainly wants work and is counted at that time as unemployed. Actually, she becomes unemployed if she doesn't get work in the Christmas peak. I am not excluding her at certain times from the group of the unemployed. But I do say that there is a period just before her annual entry to the labor market when a question whether or not she wants work may stimulate her to say, yes.

That group is not the bulk of the people who respond, "Yes; we do (or do not) want work," but it may be large enough by hundreds of thousands, or possibly by a million or so, to make the question of the enumeration of the different categories extremely difficult. That, as I say, has been carefully approached in the present census. It was not possible to do that job back in 1937.

The CHAIRMAN. In other words, you don't place very much reliance in the figures of 1937?

Mr. HINRICHs. I think they are significant guides, but I don't think we learned at that time as much as we should have.

The CHAIRMAN. Dr. Kreps, it is quarter after 12. How much more time will you need?

Dr. KREPS. I could finish in about an hour if there weren't questions.

The CHAIRMAN. Well, the committee, then, will stand in recess until—

Mr. HINRICHs (interposing). Mr. Chairman, may I have 1 minute on this table that has been introduced, just to close that?

Mr. KREPS, in this table that was marked "Exhibit No. 2437," which gives the occupational distribution of gainful workers, 1880-1939, in percentages, you referred to the relative stability of the percentage that wage earners constituted of the total working force, pointing out some decline in that percentage since 1910. By and large, those percentages indicate stability.

You referred to this table as showing some of the basic occupational changes that have taken place.

Dr. KREPS. Groups of occupations; yes.

Mr. HINRICHs. It refers to very broad groups of occupations within which there may have been very substantial occupational displacements. For example, the relative constancy of the wage-earner proportion between 1930 and 1939 was completely useless from the point of view of indicating stability of employment for cigar makers. It doesn't indicate particularly what happened to men that had been engaged in the hand-rolling process in strip steel mills, so that inside the constancy of some of these percentages there was a tremendous churning that was going on in individual occupations, and if we are talking about technological displacement and its relationship to occupation, you are thinking really along two lines, one possibly the effect that the technological change in general may have in developing a requirement for a higher skilled group, as for example more professional people per thousand workers, or more clerical workers, if that were the case; and then you also need to think the problem through

on the level of the occupations inside each of these distributions of what happened to cigar makers, what happened to steel roll operators, what happened to hand transfer knitters, and so forth, and so on.

Is that correct?

Dr. KREPS. Yes; I agree.

Dr. ANDERSON. Mr. Chairman, may I make one addition that is pertinent at this point? The table refers to an occupational distribution of gainful workers as the census uses that term "gainful workers." This is not a distribution of employed workers, as would be implied from Mr. Hinrichs' remarks. This is a distribution of the way in which workers say they are normally employed. In other words, it presents an over all, and doesn't refer to employment or unemployment or displacement of workers, but it does give you a framework picture of the distribution of gainful workers seeking employment or employed.

The CHAIRMAN. Thank you.

The committee will stand in recess until 2:15.

(Whereupon, at 12:20 p. m., a recess was taken, to reconvene at 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:25 p. m. upon the expiration of the recess, Senator O'Mahoney, the chairman, presiding.

The CHAIRMAN. The committee will please come to order. Are you ready to proceed?

Dr. KREPS. Proceeding next to the question of capital saving innovations, I think it is not overemphasizing the point to say that probably the most astounding feature of the technical progress which holds us in its grip at the present time is the extent to which capital saving devices are being invented, items such as multiplex telegraphy, fire-protection systems, cheap artificial illumination permitting 24-hour operation, skyscrapers, geophysical prospecting, and all the myriad devices of rationalization.

I have prepared a small memorandum indicating specifically what some of these capital saving devices are, from three sources.¹ One is an article in the *American Economic Review*, entitled "Effects of Current and Prospective Technological Developments Upon Capital Formation," in which are cited actual mechanical improvements that have all resulted in greatly increasing the amount of product per dollar of investment and per unit of machinery. I will cite just one to give a notion of the general tenor of the article. In the electric-utility industry, for example, a topping technique has been put into practice in which exhaust steam from high-pressure, high temperature turbines is utilized by being discharged into the steam headers of lower-pressure units. This tends to increase the capacity of existing stations from 40 to 90 percent without an increase in fuel requirements and without corresponding additions to plant and equipment, a fact which is sometimes ignored by those who state the so-called capital investment needs of utilities.

Similarly, I have got together certain excerpts from a study on inventions published in the two-volume work by Hoover's Committee on Recent Economic Changes and in that they have a section listing

¹ See "Exhibit No. 2439," pp. 17300

a variety of industrial processes and the savings in costs brought about by these industrial processes.

The CHAIRMAN. Do you state what that committee was and how it was constituted?

Dr. KREPS. President Hoover, if my memory is correct, had summoned together a committee consisting of experts in various fields, labor, industrial relations, foreign trade, and the like, to trace the changes that had taken place in the twenties and they came out I think in 1930, or thereabouts, with a report called *Recent Economic Changes*. In that report there was a rather extensive chapter on industrial rationalization and industrial innovations. It is from that report and from a table in that report that I have taken an excerpt which gives a few examples of the type of capital saving innovations introduced at that time.

The CHAIRMAN. What do you mean by capital saving innovation?

Dr. KREPS. One that enables a given firm to produce the same volume of business, either in physical amount with the same machine or with a machine costing less money; that is, either the product per dollar of invested capital is larger or sales are larger per unit of technical equipment, sometimes without supplanting a single laborer. It still takes one laborer to operate the new machine. He just has a better machine.

The CHAIRMAN. To simplify it, just a cheaper machine to do the same or better work in terms of output?

Dr. KREPS. That is correct.

Mr. HINRICHS. Capital saving is also labor saving, isn't it?

Dr. KREPS. Capital-saving devices, as my outline indicates, save labor in the production of the machine, if the machine itself is actually made cheaper, and in part answers the question whether labor is reabsorbed in the machinery-making industries. Capital-saving inventions have tended to reduce the amount of labor that can be reabsorbed in the capital-making industries.

To quote certain other examples listed in this memorandum, the American Woolen Co. reports for 1939 that it has only about half as much plant and equipment today as in 1924, but nevertheless has the actual capacity to turn out the same amount of goods.

Similarly, in the iron and steel industry the average daily output of a typical 170-ton furnace increased from 302 tons per day in 1929 to 395 tons in 1939, a rise of 31 percent.

The CHAIRMAN. May I interrupt to say that we have with us this afternoon Mr. George E. Bigge of the Social Security Board, and I want to say, Mr. Bigge, that we will be very happy to have you ask any questions that may occur to you.

Mr. BIGGE. Thank you, very kindly.

The CHAIRMAN. The committee, of course, realizes that this is a subject in which you will naturally be interested, and we will be very happy to have any contribution you might care to make by way of question or statement.

Dr. KREPS. To show in detail what happens, I have taken an excerpt from a study on the textile industry, and cotton spindles specifically, which shows that cloth production per active spindle has increased from 276 million square yards in 1929 to 410 in 1939. Although the number of spindles has gone down, the increased effectiveness of the use of the spindles has actually raised the capacity beyond what we had when we had more spindles 10 years ago

I would like to submit this exhibit from which I have quoted certain representative passages, for the record.

The CHAIRMAN. It may be received.

(The documents referred to were marked "Exhibits Nos. 2439 and 2439-A to 2439-D" and are included in the appendix on pp. 17300 to 17309.)

Dr. KREPS. To illustrate graphically what this means for our problem of idle money, I might say that it is possible to maintain and even increase productive capacity in a given industry with an actual curtailment of demand for capital. This is strikingly shown since 1920 in the automobile industry. I have a chart taken from Mr. Bell's book on *Productivity, Wages and National Income*,¹ showing the decline in fixed capital investment in the automobile industry since 1926 to a level that is now less than 80 percent of what it was in 1926. At the same time the capacity of the industry has not diminished.

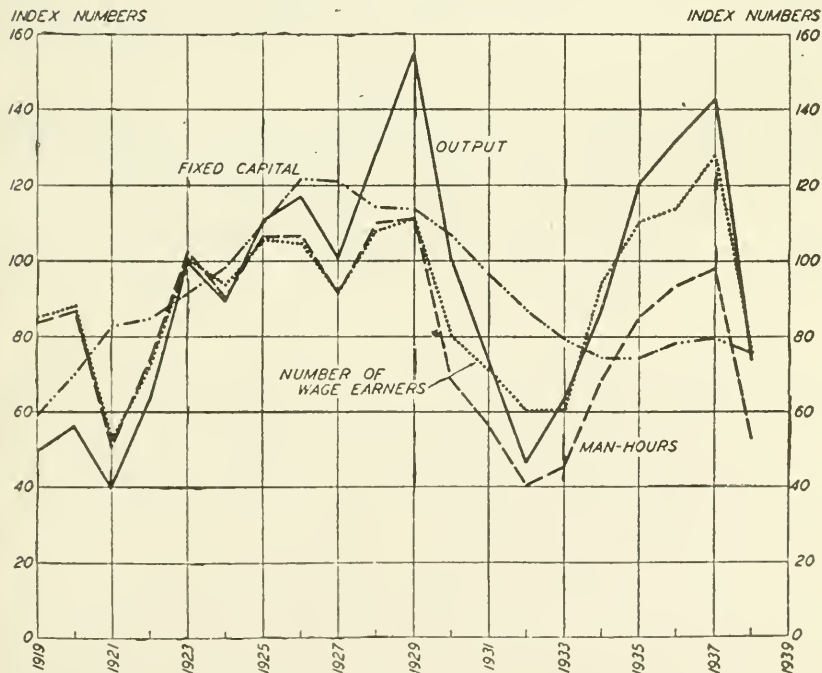
I would like to submit this chart, together with the table, as an exhibit.

The CHAIRMAN. It may be received.

(The chart referred to was marked "Exhibit No. 2440" and appears below. The statistical data on which this chart is based are included in the appendix.)

EXHIBIT No. 2440

FIXED CAPITAL INVESTMENT, OUTPUT, AND EMPLOYMENT IN THE AUTOMOBILE INDUSTRY, 1919-38* (1923-25 = 100)



¹ Spurgeon Bell, *Productivity, Wages and National Income*, Brookings Institution, 1940.

RATES OF RETURN ON INVESTED CAPITAL FOR THREE MAJOR AUTOMOBILE COMPANIES.
1927-1937

Year	General Motors	Chrysler	Ford	Year	General	Chrysler	Ford
1927.....	48.77	43.49	-3.97	1934.....	15.19	11.10	3.75
1928.....	45.75	34.91	-10.31	1935.....	25.62	40.61	3.25
1929.....	37.02	19.37	13.73	1936.....	32.82	61.12	3.98
1930.....	20.71	.71	5.79	1937.....	28.23	48.89	1.45
1931.....	15.64	4.35	-4.93	Average.....	25.25	23.59	.04
1932.....	1.34	-6.86	-10.46				
1933.....	12.57	15.68	-1.20				

Source: Federal Trade Commission, *Report on the Motor Vehicle Industry*, Washington, 1939, pp. 487, 618, 671.

Dr. WALKER. Is that accounted for in any way by the abandonment of plant?

Dr. KREPS. I don't know the detail of it, and as a matter of fact the detail will be developed in some hearings that we shall have, so I would rather have the industry speak because they have accurate first-hand knowledge. I do want to call attention to the fact that the decline in fixed capital investment can probably not be ascribed to a lack of sufficient profits in the industry to attract new capital. Throughout this period, and particularly in 1926, the industry enjoyed substantial profits and rates of return that were really above that of the average of industry generally. Such profits, however, failed to attract new capital investment, for, as this study indicates, the total amount of fixed capital investment in the industry began to decline in 1926. It is said that the most extensive investments actually made in the period were made by one of the firms that did not have nearly as good a profit record as some other firms. It changed over from a model T to model A.

In short, the alert, highly progressive managements of the automobile industry put into practice in their plants the most efficient new devices, machinery, processes, and tools known, plus all that scientific management had taught them. They thus created a capacity in excess of their 1937 volume of business. Relative to their volume of output they put in all the equipment that they needed, but so much of it consisted of capital-saving devices that total investment in fixed plant went down.

THE EFFICIENCY OF CAPITAL

Dr. KREPS. The efficiency of capital has also increased in other industries. This is not a unique case. I should like to submit a table of the record of fixed capital compared with output and employment in manufacturing, class 1 railroads, electric light and power, automobile and parts manufacturing, iron and steel manufacturing, and the cotton textile goods industry.

The CHAIRMAN. The table may be received.

(The table referred to was marked "Exhibit No. 2441" and is included in the appendix on p. 17310.)

Dr. KREPS. Such increases in the efficiency of capital may result, of course, from production control, time and motion study, budget control, orderly marketing, intelligent forecasting, improvements in shipping methods, salvage and waste reclamation, improvement in

service departments and tool control, betterments in inspection and office methods, but all tend to get more output for the same dollar of capital invested. The significance of such developments for the problem of idle money is obvious.

In the words of Lewis Mumford in his classic volume, *Technics and Civilization*:

Whereas the growth and multiplication of machines was a definite characteristic of the paleotechnic period, one may already say pretty confidently that the refinement, the diminution, and the partial elimination of the machine is a characteristic of the emerging neotechnic economy.¹

In the thirties, as before, there has been no hesitancy to invest capital in places where there has been a demonstrated need for it. To enumerate merely one or two examples, productive capacity in the rayon industry, in electric refrigerators, and in a number of chemical industries has more than doubled, even since 1935. Some of the largest chemical companies are now manufacturing substantial portions of their output in products they did not even produce in 1929. Monsanto Chemical Co. has reported recently that products whose commercial manufacture they had started since 1929 accounted for 39 percent of sales in 1938.

According to Shelby Cullom Davis, treasurer of the Delaware Fund, Inc., in a pamphlet entitled *The Investment Decisions of Industry*, many companies have changed completely from one industry to another. [Reading:]

Automobile accessory companies became builders of bathtubs, refrigerators and other household utensils. Automobile companies went into air conditioning. * * * Remington Rand went from typewriters to electric shavers. American Fork and Hoe from agricultural hand implements to sporting goods and railway track implements.²

In other words, industry has not been reluctant to make new investments when there was a market. Probably in no instance is this better shown than by the du Pont Co. in their annual report of 1937, that products relatively unknown in 1929 accounted for about 40 percent of their total sales that year.

The CHAIRMAN. What year was that?

Dr. KREPS. '37.

The CHAIRMAN. In 1937 products which were relatively unknown in 1929 accounted for 40 percent of the total sales?

Dr. KREPS. That is correct.

The CHAIRMAN. Was that in units of commodity or in dollars?

Dr. KREPS. In dollars. Among these products were some Duco finishes, Dulux enamels, Neoprene, synthetic camphor, Ponsol dyes, anhydrous ammonia, synthetic methanol, urea, titanium pigments, Viscose rayon, cellophane, and cellulose film.

The CHAIRMAN. All of those products, I suppose, would fall into the category of which you spoke this morning when you were discussing the cooperative nature of modern invention and discovery.

Dr. KREPS. That is correct.

The CHAIRMAN. These could be produced only by group activity, research, and study of a number of persons in the modern type of laboratory.

¹ Lewis Mumford, *Technics and Civilization*, Harcourt, Brace, New York, 1934, p. 258.

² Shelby Cullom Davis, *The Investment Decisions of Industry*, p. 8.

Dr. KREPS. That is right, by being alert.

The CHAIRMAN. Maintained by an institution, or by one of these large corporations.

Dr. KREPS. Exactly.

In 1927 they had only 10,700 workers making products like this. In 1937 they had 18,000. During the same period the company's investment in facilities for manufacturing these products increased from \$65,000,000 to \$174,000,000.

The CHAIRMAN. How many of these products are substitutes for natural products and how many of them are completely new products that were never used before, and which therefore do not compete, or compete only slightly, with previously known commodities or natural resources?

Dr. KREPS. That makes a larger demand upon my information concerning the chemical industry than I possess, but it is quite clear that synthetic methanol represents a substitute for a natural product such as you spoke of, that some of the finishes represent products new in composition, products that resulted in greatly decreasing the expense of painting automobiles and gave us a much superior finish. At the same time they also displaced some of the inefficient materials and inefficient hand methods and other methods.

Similarly, cellophane has in part developed a new market, as all these products tend to do, and in part supplanted an old market. When I say "supplant" I never want to be taken to mean 100 percent. For instance, this morning I talked about the electrical refrigerator tending to supplant the ice plant, but actually the sales of natural ice have not gone down a great deal. The need for refrigeration has become evident to people through the advertisement of mechanical refrigeration, so you have a larger volume of output, with the older industry finding a niche in this larger volume.

The CHAIRMAN. The electrical refrigerator can go into homes which could not possibly be served by the ice man.

Dr. KREPS. It works both ways. That is, you see, the factor of interindustry repercussion, which makes each particular commodity a study in itself. I have written a book which is devoted to one product that probably the members of the committee have rarely heard about, sulfuric acid, and yet problems of this sort arise, interindustry competition, intercommodity competition, joint cost, and developments of one sort or another, interprocess competition within the same industry.

Mr. PIKE. You think possibly among such products ethyl fluid might be one of the really new nondisplacing things?

Dr. KREPS. One would think so.

Mr. PIKE. That is as near as anything I can think of.

Dr. KREPS. Yes.

Incidentally, in these products, since the first time they were put on the market there has been a 40-percent decline in the price quoted in 1928. That again is a result of progress in technology.

At the present time industry needs more market rather than more capacity. Most of industry is equipped to produce a \$90,000,000,000 or \$100,000,000,000 national income. In the symposium of opinions of business executives in the New York *Sun* in its annual-review

edition on Saturday, January 6, Lincoln Cromwell says for the textile industry:

There is little capital going into new cloth mills. Those we have can oversupply the market on two 40-hour shifts.

The CHAIRMAN. That is another way of saying that the problem now is one of distribution rather than of production.

Dr. KREPS. Yes; I think that would follow.

The CHAIRMAN. Do you find any difference of opinion on that?

Dr. KREPS. There is some difference of opinion on that topic.

The CHAIRMAN. What is the contrary view?

Dr. KREPS. Well, some feel that you must have an investment in capacity irrespective of whether that capacity is going to be used or not, that that investment in capacity then stimulates consumption and gives better distribution.

Similarly, railroad executives were almost unanimous on the point, to quote A. N. Williams of the Lehigh Valley Railroad, that—

The railroads are ready for more traffic when it comes. * * * Railroads are getting more out of their power and equipment than ever before. * * * We cannot escape the fact that the railroads now handle more traffic with less cars and locomotives.

In fact the only industries even at the high level of operations last fall, equal to 1929, that felt a strain upon capacity to produce were those that make war equipment, notably the airplane industry. This means, of course, that calculations tending to show how much obsolescence exists in American enterprise, based on 1929 valuations and so-called nonreplacement, lack solid substance. If it takes only a \$5 machine to produce the same amount of stuff as was produced by a \$10 machine 10 years ago, obviously there is not \$5 of underdepreciation or of obsolescence which can be represented as measuring a demand for capital goods. Such calculations completely ignore the most significant technological advance of the last 20 years, that of capital-saving innovation.

TECHNOLOGY AND THE BUSINESS CYCLE

Dr. KREPS. I turn to the question, Before the advent of technology, was there a modern business cycle? The connection between the modern cyclical fluctuations of business and the use of large amounts of fixed capital and equipment is stressed by all analysts of the business cycle, but especially by Bouniatian in his classic volume *Les Crises Economiques*.¹ Obviously a great portion of the fluctuation of business is due to the fact that errors in plant investment are made.

(Representative Summers assumed the chair.)

Dr. KREPS. The further away from the consumer the original decision to try to fill his demand, obviously the greater chance for things happening which were not anticipated. No one who has analyzed the effect of technology on modern life has ever come to any conclusion different from that which Dr. Harry Jerome of the National Bureau of Economic Research summarizes in his volume on *Mechanization in Industry*, in the following words:

Finally, while advancing mechanization probably tends to lessen seasonal fluctuations in industry, there is reason to suspect that it may aggravate

¹ Mentor Bouniatian, *Les Crises Economiques*, M. Giard, Paris, 1922.

cyclical fluctuations through intensifying competition, enlarging the function of capital goods in the economic system, and * * * increasing the share of expenditures in those lines, such as durable consumer goods, the effective demand for which is characterized by sharp reductions when a recession sets in. In brief, to the extent that mechanization contributes to the unpredictability and the variability of economic processes, it may likewise contribute to an aggravation of the severity of cyclical fluctuations.¹

Or, in the words of Emil Lederer, in his volume *Technical Progress and Unemployment*, written for the International Labour Office, "technical progress aggravates the typical phenomena of depression."² Investment in capital goods starts credit expansion and usually results in malinvestment or so-called overcapacity in some line or other. When the bubble collapses we have the modern business depression—want in the midst of plenty—a new phenomenon completely different from those periods of feast and famine that existed in antiquity. Depressions then were periods of scarcity. Today scarcity is one way of making profits. Today it is abundance that characterizes depressions—a direct result of the miraculous ability to produce goods given us by technology.

DOES INDUSTRY NEED MORE CAPACITY?

Dr. KREPS. The next question I wanted to deal with has been argued about a great deal: Who has received the benefits of technology in the last 20 years? And I don't propose to embarrass the committee with a large treatise of statistics on prices and the rest, but I shall give you the summary results of two or three such studies.

Representative REECE. Would an interruption bother you before you leave the question which you were discussing when I came in? I don't want you to repeat it for my benefit, but having only heard part of it I am not quite sure about the conclusions which you reach. Was this conclusion that we did not need a further expansion of plants at this time, but that the problem now was largely one of administration?

Dr. KREPS. No; I was merely emphasizing that the question of capacity is one that isn't bothering American business at the present time; that is, the question of inability to give the consumer what he can pay for. What they really need is more market, more consumers coming on the market with funds ready to buy those goods. In other words, there was no problem of underinvestment in the sense that industries were begging for capital and couldn't get it.

Representative REECE. We are not yet in a position of the young man who comes into a large inheritance, to be under no necessity for putting it to work, but only the necessity for administering and spending.

Dr. KREPS. No.

The VICE CHAIRMAN. Doctor, don't you think it is pretty well agreed by everybody going around the country, without regard to statistics or data, that we have plenty of everything to produce everything we need if we could just manage to distribute it around?

¹ Harry Jerome, *Mechanization in Industry*, National Bureau of Economic Research, New York, 1934, p. 22-23.

² Emil Lederer, *Technical Progress and Unemployment*, International Labour Office, Studies and Reports Series C (Employment and Unemployment, No. 22). Geneva, 1938, p. 248.

There is no dearth, there are plenty of people to produce food and there are plenty of machines to produce all the things we need, and we have plenty of railroads to haul them around.

Dr. KREPS. I would say that is certainly a strong current of thought.

The VICE CHAIRMAN. All the folks who go around the country a little bit know that pretty well, don't they?

Dr. KREPS. I think so; yes, sir. Sometimes this problem of idle money is approached from the point that somehow or other there is an enormous demand in industry, but for some reason or other, it doesn't attract idle money.

The VICE CHAIRMAN. The only reason a person who has some idle money keeps it idle is because he doesn't know where he can make a safe investment profitably. If you and I had \$50, we would be governed by the same application, wouldn't we?

Dr. KREPS. I think so.

The VICE CHAIRMAN. And the man who has \$50,000,000 is just the same sort of a person.

Dr. KREPS. Yes, I think the problem is more market. There is the neck of the bottle.

The VICE CHAIRMAN. Yes, sure. It doesn't take a smart man to see that. Every man knows that.

Representative WILLIAMS. Have you any figures, or are there any available, that show the percentage of capacity of production that is now being utilized in general?

Dr. KREPS. There has been no survey of potential capacity since 1929. The Brookings Institution made a good survey,¹ and then there was another one by Loeb and associates, called the *Chart of Plenty*,² which has been subjected to considerable criticism one way or another. We do know, looking at industry after industry and judging by the reports of executives in the industry—I have just quoted from the statements given by executives to the New York *Sun* in the annual review edition of this year—that in industry after industry the executives say, "We can fill the demand for an increased volume of business, even over 1929 levels."

Representative WILLIAMS. That being true, of course there would be no demand for capital investment further along that line, would there?

Dr. KREPS. There is a school of thought that feels exactly that way, among which I would class myself.

Representative WILLIAMS. But upon what basis does the other school of thought rest? What is the economic theory back of the other idea that it is necessary or proper or useful to invest capital funds where there isn't any necessity for it, from the production standpoint? I can't see, myself, any basis for that kind of thought. There may be one.

Dr. KREPS. It is prominently argued, at any rate.

The VICE CHAIRMAN. You know, we have a lot of talk here about credit, about doing something about credit. Well, as Judge Williams indicates, credit doesn't help you to sell your goods. Somebody might borrow some money and buy some of your goods, but when you got

¹ Nourse and associates, *America's Capacity to Produce*, Brookings Institution, 1934.

² Loeb and associates, *The Chart of Plenty*, Viking Press, 1939.

ready to collect, he probably wouldn't have any more money than when you sold them to him. We seem to be adopting in this country the general psychology of the old lady who thanked God she had been able to borrow enough money to pay all her debts, and it doesn't seem to work.

Dr. KREPS. This controversy is just one of the controversies in the field of technology, and is no larger than that controversy which I am now going to raise, which is, Who has received the benefits of technology?

WHO BENEFITS FROM TECHNOLOGY?

Dr. KREPS. The extraordinary increase in production represented by the fact that in the United States in 1933, 43 men produced the volume of goods that required 100 men in 1899 has been characterized by Dr. Mills in an article entitled "Man and the Machine," which he wrote for the magazine *Today* in its issue of November 28, 1936, as—

A new industrial revolution, a revolution that strikes more deeply, falls upon a much wider front and a more complicated industrial system, and threatens more violent disturbances than did its progenitor of 150 years ago. . . . The heart of the problem that arises out of such technical and organizational advance—

he goes on to say, is the question whether it will mean—

on the one hand exceptional prosperity for limited groups, with concurrent unemployment of men and other productive resources or, on the other hand, higher living standards for the population at large.

Professor Mills has shown in his studies that prior to 1914 the benefits of technology were on the whole passed on to consumers and farmers in the form of lower prices. As a result 112 men were hired for every 100 men displaced. But after the World War a change took place. Even in the period from 1923 to 1929 only 91 new men were employed for each 100 displaced. These may not have remained unemployed for long at a time. They crowded into such occupations as hotel services, restaurant cooks and waiters, taxi drivers, beauty shop employees, garage workers, gas station attendants, and the like. But they were the first to be thrown out when the bubble broke in Wall Street in 1929.

If I may be permitted to quote Professor Mills here rather extensively:

Under prewar conditions, when higher productivity was promptly reflected in lower costs and lower selling prices, new contacts were established without great delay and without persistent hardships. * * * For a number of reasons, the gains in production since the war have gone largely to the managers and owners of industrial plants and to the men who work for industrial plants. * * *

Here is the central fact that emerges from this analysis. A host of economic frictions impede the readjustments made necessary by increasing industrial efficiency. The machine process itself, with its heavy fixed charges, has placed major barriers in the way of prompt adaptation of prices to changing circumstances. Most of the obligations of a modern business are fixed, in terms of dollars, and these rigid monetary charges tend to freeze great areas of the price system. To these elements we must add monopolistic and semi-monopolistic controls, public regulation of rates, the persistence of customary prices and scores of other factors that impede price changes and restrict the flow of capital, labor and enterprise. It is these frictions, apparently inescapable today, that prevent the prompt and full utilization of technical improvements.¹

¹ Frederick C. Mills, "Man and the Machine," in *Today*, Nov. 28, 1936.

The VICE CHAIRMAN. Doctor, as I understand your statement, it is that these technical improvements increase the amount of capital investment necessary to develop a unit of production that is economic in its operation.

Dr. KREPS. Right.

The VICE CHAIRMAN. That is pretty significant, isn't it?

Dr. KREPS. I think so. I think it is the heart of the problem.

The VICE CHAIRMAN. Mechanical developments tend to put the man of relatively small capital out of the picture insofar as concerns his ability to compete with the person who has more money and can buy modern equipment of sufficient size.

Dr. KREPS. In many industries that is the result.

The VICE CHAIRMAN. And in addition to that—I don't know whether this is beside your point—it requires a pretty big producing unit to be able to maintain an agency of distribution that can get to the general market. It seems to me that is in the picture.

Dr. KREPS. That is correct.

The VICE CHAIRMAN. I don't want to make a speech, but it seems to me that regardless of what may be to the advantage of the other side, the tendency to uniform wages everywhere it seems would tend to eliminate the small machine of probably not the highest productive capacity for unit of product. Take a cotton mill, an operator whose machinery is not the most modern but still can produce cloth, but not as cheaply as the better machines would produce it—it would seem that probably the operator of that plant couldn't pay as much money as the operator of the most modern plant. That seems to me to be in the picture. There may be something on the other side that quite overbalances that, but those things all seem to be tending in the direction of the concentration of the opportunity to produce and market.

Dr. KREPS. That is correct.

Representative WILLIAMS. Did I understand you to say, Doctor, that during the twenties for every 100 employees displaced, 91 were reemployed?

Dr. KREPS. In industries in which displacement occurred, that is correct.

Representative WILLIAMS. What has been the record since '29?

Dr. KREPS. We don't have the figures. I am giving you the results here of about 2,000 pages of statistics in 3 volumes by Frederick C. Mills, and that study of Mills has not been carried on to date in the same form. There have been other studies but they don't permit me to answer your question by quoting any number. We know that productivity has increased at something like a steady rate right through the thirties.

Representative WILLIAMS. And do you know that the displacement has been greater or less?

Dr. KREPS. All I could say in the absence of such definite measurements as Dr. Mills gives is that the evidence that I see leads me not to change what I conceive to be Dr. Mills' contention. In other words, there hasn't been so far as I can see, any tendency for displacement to become less in the thirties than it was in the twenties.

Representative WILLIAMS. It seems to me that is rather significant for our inquiry here to try to determine if we can whether or not

that tendency is increasing more and more. Of course, if that study hasn't been made, we just haven't got that information.

Dr. KREPS. It is a very difficult technical matter to make a relatively simple statement such as the one I have just made.

The VICE CHAIRMAN. And your statement is that from the best study you have been able to make, you are convinced that the increase of employment has not kept pace with the increase of productivity.

Dr. KREPS. Yes.

The VICE CHAIRMAN. And that would seem to indicate, as a matter of fact, it does not always follow that improvement in machinery results in better employment.

Dr. KREPS. No, not unless other things are adjusted, prices and a whole host of other factors, if you are going to get an increase in employment with an increase in productivity.

The VICE CHAIRMAN. It would seem probable to me that where the energy, the intellectual energy, of the people is devoted too much to improving the mechanism and not enough to taking care of the people who are released by reason of improved machinery, that it would be a question just how substantial progress that is when you put a machine in the place of a living human being and he walks the street and eats the bread of charity. Somebody may brag on the man who put the machine up there, but it would seem to be a serious question fundamentally as to just how much good he has done to society, until society does something about it.

Dr. KREPS. I would agree that if we don't make the economic adjustments, so the hind wheels of the automobile go as fast as the front wheels, or our technology—in other words, if we don't synchronize our changes, we are in for major spells of jerky production and distribution.

The VICE CHAIRMAN. The Government is continuing, however, to offer a premium, to offer an inducement of 17 years of monopolistic use to anybody who can figure out a machine that will put somebody else out of a job.

Representative WILLIAMS. While we are on that question of productivity and the relation to what it was 10 years ago, is it already in the record whether or not there has been an increase or a decrease in productivity during the last 10 years, from '29 to '39?

Dr. KREPS. Yes; I placed in the record this morning a series of exhibits.

Representative WILLIAMS. Have you that in percentages? I am talking as a whole, not as applied to any particular industry, just to get that broad picture of it.

Dr. KREPS. As a whole it is about 30 percent, somewhere in that vicinity, varying enormously from industry to industry.

Representative WILLIAMS. But the average productivity has increased during that decade 30 percent?

Dr. KREPS. In the manufacturing industries which were examined by the National Research Project.

Representative WILLIAMS. During that same time has consumption kept pace with productivity?

Dr. KREPS. I don't have the figures on consumption or consumption per worker. My recollection is—and I would defer to the Bureau of Labor Statistics in this regard—that real wages per worker employed are higher today than they were in '29.

HOW MANY ARE NOW EMPLOYED?

Representative WILLIAMS. And just one other question now: What about the number of actually employed compared with '29?

Dr. KREPS. I don't have those figures at my finger-tips. I would have to go to the Bureau of Labor Statistics and try to secure them.

Representative WILLIAMS. To my mind there are some very fundamental statistics that we certainly ought to agree on in this hearing if they are available, and it seems to me they should be, and that is one of them, whether or not there has been an increase or decrease of employment in the productive industries in the country and to what extent the productivity has increased, whether or not consumption has kept pace with productivity, and to my mind, what has been the labor cost to industry in this production.

Dr. KREPS. I submitted figures this morning showing the decline in unit wage cost that is accompanying recent increases in productivity. The reason I hesitated about answering your question on the total volume of employment is of course that we have had no good record of the number employed. All of us have to reason from the small sample for which the Bureau of Labor Statistics is collecting monthly figures. They are estimates.

Representative WILLIAMS. The reason I am asking that question is to try to get some authentic figures, because it ranges from nothing to a great many. It has got a very wide range in the discussion that is taking place in the newspapers and among some of the supposed economists of the country, and it does seem to me that we ought to reach some kind of a reasonable, fair, approximate understanding as to what is the truth about the matter.

Mr. HINRICHS. Mr. Chairman, there doesn't seem to be a very great range with reference to the estimate of the number of people employed. In the case of manufacturing industries the comparisons can be made quite exactly. In 1937 approximately the same number of people were employed in manufacturing as in 1929. At the present time the number is slightly less than it was in 1937 or 1929. The estimates for trade are not as good as the estimates for manufacturing. They indicate approximately the same levels of employment now as in 1929. We have no census information on trade since 1935. The census figures of the present year may indicate that there is some underestimate currently of the amount of employment.

In the construction field the figures on employment and all other aspects of that fundamentally important industry are woefully inadequate. We do know, however, that construction employment is very substantially below the levels of 1929. There is some question with reference to the figures on transportation.

In the railroads we know that the level of employment is substantially below the levels of 1929. As far as we can get any indication for the total field of transportation that would also be somewhat less than in 1929. The difficulty is there that we measure the areas where employment is decreasing more accurately than we measure the areas like motor trucking where the employment is increasing, and again I refer, as I have done several times in the past, to the census information against which we have to put current estimates periodically as they become available.

If you add up all of the figures that we can now put together as a basis of estimating nonagricultural employment, our current estimates of nonagricultural employment would be 33,800,000 people as against an average in 1929 of about 36,000,000 in nonagricultural employments. Now if you put together the question marks that people place against these estimates (not that the estimate could be better made at the present time, but simply that there are fields for which information is sadly lacking, where there is no basis of making a really sound estimate) and add up the probabilities, there is a probability that that estimate of 33.8 million is somewhat too low; we wouldn't be astonished if in various fields for which we have comparatively little information, casual workers, various types of service industry, we found that in the aggregate that figure was as much as a million too low.

At the end of a period of 10 years of the most violent changes in employment that we have ever known, I do not feel that that estimate is altogether bad. It means that we are estimating within a margin of some 2 or 3 percent, and have been looking forward regularly to the fact that just exactly today our information is worse than it is ever going to be or could ever have been; that is, we have come to the end of a 10-year period, a census is now being taken in this week that will give us a more accurate tying point for this whole series on the basis of which projections will be made, or estimates will be made from month to month, over the next 10 years, and in 1949 as in 1939 certain parts of that estimating process are going to be dangerously inaccurate. But if you say, what is the relationship between employment now and in 1929, within approximate levels at least we can estimate it, in some lines very accurately, in other lines less accurately, and the margin of doubt is in the order probably of a million people as between the judgment of various people. We are quite sure it is not less than our present estimates would indicate.

(Representative Williams assumed the chair.)

AVERAGE COST OF PRODUCTION

Acting Chairman WILLIAMS. You have already put in the record the decreased labor cost to industry?

Dr. KREPS. I have.

Acting Chairman WILLIAMS. Now what has been the actual trend with reference to the cost of production?

Dr. KREPS. I haven't, of course, the figures on the total cost of production, but the unit wage cost—

Acting Chairman WILLIAMS (interposing). I understand you have that in, but I am asking now what is the trend so far as the total cost of production has been during the last 10 years.

Dr. KREPS. In a particular industry?

Acting Chairman WILLIAMS. No; over the whole field.

Dr. KREPS. I am afraid I am not competent to answer that question. I wish I could.

Acting Chairman WILLIAMS. In other words, whether the cost of production as a whole has decreased or increased over that period.

Dr. KREPS. Of course it would vary with the industry.

Acting Chairman WILLIAMS. Naturally so, but I am trying to get a picture of the whole industry.

Dr. KREPS. Prices are lower than they were in some years in the twenties, and raw material costs are different, and the like.

Acting Chairman WILLIAMS. Then I judge from what you say we have not made any study, there aren't any figures available, to give us an idea of what the trend has been during the last ten years in the field of production with reference to its costs.

Dr. KREPS. No; we would say on grounds of general theory that prices and costs tend to be in line. Presumably costs came down in about the same way that prices have come down, but you are quite right, there has been no survey. There have been, of course, studies of costs of particular elements in particular industries. There has been a summation year by year of what has happened to certain types of costs in those industries.

Acting Chairman WILLIAMS. I had the impression that the claim had been made by certain industries especially that labor cost of production had been very materially increased in the last few years.

Dr. KREPS. I think that you will find that such claims usually rest upon a confused notion of what is labor cost per unit as opposed to wage rates. Wage rates have risen, but of course the wage rate is not the same as labor cost. The factor of productivity has been ignored. The charts that I showed this morning indicate almost universally an increase in wage rates per hour, but at the same time so much greater increase in productivity that unit wage cost per unit of product, which is the important item in quoting price, has gone down, broadly, since the twenties.

Acting Chairman WILLIAMS. It would look rather reasonable to me that that being true, so far as the labor cost is concerned, it might probably be true as to the general cost.

Of course I realize that there are a number of elements that go into cost outside the labor.

Dr. KREPS. I was going to remark that probably some elements such as taxes may have risen appreciably.

Acting Chairman WILLIAMS. Interest may have gone down.

Dr. KREPS. That is correct.

NONPRODUCTIVE WORKERS

Mr. PIKE. While you are off the track a little bit, Doctor, may we take this additional trip around. I was looking at your "Exhibit 2437," which gives me some idea that a great deal of the saving made in the primary production, the saving in actual wage earners on a machine, has gone to other people a little bit farther from primary production, the managers and clerks and the free riders, you might say. In 1880, against 52.7 wage earners you had 10.9 distribution, managerial, and professional people; in other words, around 5 wage earners carried 1 white collar man. In 1939 as against 54.3 wage earners you had 26.93 riders, so that every 2 wage earners had to carry a white collar worker. It probably is inevitable, along with higher technological efficiency, to have more management and professional help around the factory. I would say the laboratory would be part of it—not really a free rider in that sense, but not directly engaged in production. There has been more overhead on business in the way of people not directly at machines.

Dr. KREPS. Yes; they have been classified by accounting systems as overhead.

Mr. PIKE. A difference of 5 to 1 as against 2 to 1 in 60 years is quite marked.

Dr. KREPS. Of course, a machine that does the back-breaking job may involve substitution of a clerical worker who is just as productive as were the people doing the back-breaking work.

Mr. PIKE. And also they have to put a lot more people on the road to peddle them.

Dr. KREPS. The conclusion that something has happened to prices since the World War which has prevented the benefits of technology from being fully distributed to consumers is one that is arrived at by a wide variety of authorities. The Brookings Institution came to something of the same conclusion in a well-known study on *Income and Economic Progress*.¹ That situation has not changed in recent years.

Dr. Mills, writing in the New York *Sun* as late as January 6 of this year, stated that while "some correction of 1933 distortions has been effected," and he meant by that the distortion which his study revealed in 1933—

there still exist price and wage disparities, exemplified by low farm prices, high construction costs, high costs of some capital goods and high labor costs in certain industrial processes, that make for unemployment, idle equipment and a low volume of production. The benefits of technical progress must be widely disseminated. Economic bottlenecks are created when the gains resulting from industrial improvements are retained by a few. Price reductions are the surest way of effecting the desirable wide distribution of productivity gains. The advance of some 30 percent in man-hour output in manufacturing industries since 1929 is only in part reflected in prices to consumers today.

The fact of technology, therefore, makes the work being done by the Temporary National Economic Committee on concentration of economic power of crucial importance. For technology is bound to cause aggravating problems to the economy unless the benefits of the machine are distributed to the consumer in lower prices. The best argument for, if not the proof and substance of, technical progress consists of the lower prices that are quoted to consumers. These savings from increasing productivity, if passed on to consumers, increase the purchasing power of millions of people and thereby give increased opportunities for employment to millions of businesses throughout the country.

THE GENERAL EFFECTS OF TECHNOLOGY

Dr. KREPS. Now I turn to the final part of the testimony, part 3, in which I try to give some picture of the general effects of technology. So far we have been talking exclusively about economic effects, effects on labor productivity, prices, and the like.

Acting Chairman WILLIAMS. I would like to ask one question just before you leave the subject you were just on: Have you any figures available to show to what extent these benefits in cost and prices have been passed on to the consumers?

Dr. KREPS. There are variable measures. Dr. Bell, in the study which was referred to this morning, has figures that would indicate that while a substantial proportion of the increase in productivity

¹ Harold G. Moulton, *Income and Economic Progress*, Brookings Institution, Washington, 1935.

was passed on to consumers in the form of lower prices, by no means all of it was.

Acting Chairman WILLIAMS. That is not only shown, I assume, in the reduced price, but perhaps in the increased efficiency of the service and the better material, also, that has been passed on by reason of these technological processes.

Dr. KREPS. Quite so.

Acting Chairman WILLIAMS. Not only a lower cost, but better materials, better goods.

Dr. KREPS. Probably the dominant form in which the benefits of technology have been passed on has been in leisure, shorter hours to those employed, and, of course, complete absence of employment to others, whose exact number we don't know.

Now, so far, only a few of the major economic effects have been considered, in fact only those likely to occur at a given moment of time. But an innovation rarely shows its full power except after years and decades have elapsed. Moreover, it shows itself with different power in different countries, causing all sorts of changes in social life, in government, in education, and in religion.

The automobile, for example, affects not only the railroads, but the family, the size of our cities, the types of crime, the tendency for county seats to grow, as well as our manners, and, according to some, our morals. It has undoubtedly stimulated the growth of suburbs, changed the nature of much of our hotel business, decreased the employment of domestic servants, changed marketing areas, and made oil one of the centers of controversy in international politics. It has saddled our State and local governments with a vast burden of debt for the building of roads, brought in central school systems, dotted the landscape with tourist camps and roadside restaurants and pine board retail huts, in addition to killing and injuring more people each year in the United States than the American Army lost in battle during the World War.

A sample of the types of effects which must be studied even to trace out the more important changes caused by one relatively simple invention is interestingly shown on Exhibit 2442, which I should like to submit for the record. I have only taken an excerpt of some of the changes that are here listed. Each one of those could in turn be developed. For instance, there is one item, "interest in sports increased, it is generally admitted," and that leads to a number of other effects. I merely introduce this to indicate the complexity of the results that occurs when you try to trace the total effects of technology, and yet that is what statesmen have to do. Fortunately, economists do not.

I would like to submit this for the record.

(Representative Reece assumed the chair.)

Acting Chairman REECE. It may be admitted.

(The document referred to was marked "Exhibit No. 2442" and is included in the appendix on p. 17311-17312.)

Dr. KREPS. Obviously it is impossible to do more than name some of the more important results, and a few of these are indicated in an outline which shows the different levels of analysis within which most discussions take place, and I propose to discuss briefly only the topics that are underscored. I should like not to read the outline in

its entirety, but to have it introduced into the record at this point, not as an exhibit but as part of the testimony.

Acting Chairman REECE. As part of your remarks? It may be so admitted.

(The matter referred to follows:)

Levels of analysis

	Business policy	Industrial policy	Economic policy	Public policy
Having reference to	The business enterprise	The industry or trade	The economy	The whole life of the nation, economic, political, social, artistic, educational, etc. Enlargement of human liberties Protection of weak against the strong
Primary objectives	More profits either by increasing or restricting production Larger size Increased economic power	Expanding markets Larger share of consumer dollar Maximum use of government to secure tariffs, loans and other aid	Equal competitive opportunity Maximum consumption Capacity production Full employment	Elimination of economic duress and fraud National security Conservation of natural and human resources
Dominant interest	The interest of stockholders or proprietors Industrial empire-building	The interest of the organized, typically the larger concerns	Greatest good of the greatest number Consumer sovereignty	The national interest, i. e., the political, religious and cultural mores comprising the American way
Specialist with practical knowledge	The business manager	The industrial leader The trade association executive	The economist	The statesman
Types of prices or price control desired	"Good prices" Concessions when necessary	Don't chisel (ump of business fallacy) "Stabilized prices" obtained by adjusting production to consumption, by implicit or agreed on formulae, and/or by "fair or unfair" trade legislation	Prices promoting maximum consumption Prices responsive to competition Prices uncontrolled by any one person or group	Monopoly the enemy of democracy Uneconomically high prices to regulate consumption, e. g., liquor, or insure self-sufficiency e. g. war chemicals Subsidized prices to promote consumption, e. g. housing
Payrolls	An expense limiting ability to compete A stimulus to labor effort	A barrier to lower costs and wider market	Mass purchasing power vital to mass consumption	A public cost, e. g. in time of war The proof and substance of public well-being
Costs of technology	Plants, tools and machines displaced Increased overhead Market research Cost of developing market	Small businesses displaced Migration of industry Defensive investment Restrictive national planning, especially cartels	Consumer illiteracy Loss of investment in labor skills Vocational retraining Displaced labor force thrown on community <i>Gigantic economic states</i> Wastes of monopoly and monopolistic competition Concentration of production, employment and investment decisions in a few hands Recurrent business depressions	Breakdown of family unit of production Standardization of work Occupational obsolescence Loss of handicraft artistry Factory towns Pressure groups <i>Increased interdependence</i> Increased centralization of economic and political controls <i>Increased destructiveness of war</i>

Levels of analysis—Continued.

	Business policy	Industrial policy	Economic policy	Public policy
Benefits of technology	<p>Lowers accounting costs by substituting mechanical for human power</p> <p>Affords surer control of processes of production</p> <p>Provides outlet for surplus earnings</p> <p>Implements industrial empire building</p>	<p>Promotes standardization</p> <p>Provides common basis for associational activity</p> <p>Affords weapon against outsider and chiseler</p> <p>Softens rigors of competition</p>	<p>New commodities and services</p> <p>Inter-industry competition</p> <p>Inter-commodity competition</p> <p>Lower prices</p> <p>Improved quality</p> <p>Higher wages</p> <p>Shorter work week</p> <p>Less child labor</p> <p>Fuller utilization of natural resources</p>	<p>Broader basis for higher standard of living</p> <p>Increased leisure</p> <p><i>Increased opportunity to create a civilization</i></p>

Dr. KREPS. Then I should like to point out that in the outline I have sketched the various horizons of thinking on the whole question of technology. You will find you will be able to identify—I was going to say pigeonhole—the remarks of most people, and sometimes even all the remarks that they not only have made but will ever make, in one of these classifications.

For instance, the first group I list is that of "business policy," that which affects the individual business enterprise and its welfare. Those might be called, if you like, individual effects. Technology, for example, involves as costs such accounting figures as the plants, tools, and machinery displaced, the increased overhead, the market research, the cost of developing the market; the benefits of technology to the individual enterpriser represent substantially lowered accounting costs in addition to affording surer control of production, providing outlet for surplus earnings of that firm, and implementing their expansion.

Others will reason from the point of view of an industry. They get beyond the individual firm and its problems, and talk about the industry as a whole, generalizing usually for some section of the industry. Sometimes the industry is divided into small businesses and large businesses, those of one process opposed to businesses of another process, businesses in one region sometimes opposed to businesses in another region, but very often the experience and the economic reasoning of people tends to be guided by the fact that on the whole, the horizon of their thought is, What is beneficial to that industry?

And referring to the costs of technology, as far as the industry is concerned, the small businesses that are displaced represent a cost very often causing vigorous protest.

The migration of industry that takes place is a cost to the industry concerned; the defensive investment that is necessary, the restrictive national planning that takes place, especially of the cartel type.

ECONOMIC POLICY

Dr. KREPS. Then the level that goes beyond an individual industry and tries to consider the economy, the wealth-getting, wealth-using activities of men, is what I have termed "economic policy," and economic policy, as you notice, has different objectives from business policy. A business has to make profits or there will be no business.

But so far as the economy is concerned, profits is a lure or inducement. What we really want from our economic structure is something like equal competitive opportunity, maximum chance for business to grow, something like maximum consumption, capacity production, and full employment.

Similarly, so far as technology is concerned, technology involves certain definite economic costs that may not be met by the individual business, may not have to be met by them, such as the cost of occupational obsolescence or the cost of retraining workers whose skill has been supplanted, or finding jobs for workers who are no longer needed. Even though the business can get rid of them, and even though the industry can get rid of them, the economy cannot. You have to support these men. They represent social costs involved.

I should go on to say, so far as economic policy is concerned, that the benefits of technology in terms of shorter workweek and less child labor, fuller utilization of natural resources, higher wages, improved quality, lower prices, are benefits which sometimes the individual business may not like, particularly the lower prices. Whatever resistance there is to lower prices is rarely found on the part of economists.

Now, finally, the legislators' job is more difficult by far, because the legislator has to consider public policy, the national interest, the political, religious, and cultural mores comprising the American way, and the legislator often has to disregard what is good business and what is good economics because it is bad public policy.

Mr. PIKE. We could get the price of liquor down if it wasn't for public policy.

Dr. KREPS. And there are certain social costs of technology that have become important—factory towns, pressure groups, increased destructiveness of war; and there are certain social benefits to be achieved, to be achieved not by solving economic problems but by solving public problems, including that of an increased opportunity to create a civilization.

Now, as I say, when people argue on the question of technology, you will usually find them arguing from one or the other of these points of view, one or the other of these levels, and frequently they never get away from any one of them.

I propose only to look very briefly at the five points underscored, namely, the effect of technology in creating certain large economic units, its impact upon the problem of pressure-group politics, its impact upon our economic interdependence, its impact upon the increased destructiveness of war, and finally, its promise of a better civilization.

TECHNOLOGY AND MODERN BUSINESS EMPIRES

Dr. KREPS. Technology, in the typical instance, means the use of power, of specialized equipment, large factories, large plant, and large sums of money. In the railroad industry and public utilities, steel and automobile manufacture, the aggregates of capital required for efficient size are much larger than any but the extraordinary individual can supply. Consequently the corporation has been developed, which could mass the savings and efforts of hundreds of thousands of people so that we might have abundance.

These aggregates of industrial production have in the last century grown so much in economic power that they have become of primary significance in modern economic life, a significance which Woodrow Wilson, in an address in 1910 to the American Bar Association, expressed as follows:

A modern corporation is an economic society, a little economic state—and not always little, even as compared with states. Many modern corporations wield revenues and command resources which no ancient state possessed, and which some modern bodies politic show no approach to in their budgets. * * *

Society cannot afford to have individuals wield the power of thousands without personal responsibility. It cannot afford to let its strongest men be the only men who are inaccessible to the law. Modern democratic society, in particular, cannot afford to constitute its economic undertaking upon the monarchical or aristocratic principle and adopt the fiction that the kings and great men thus set up can do no wrong which will make them personally amenable to the law which restrains smaller men; that their kingdoms, not themselves, must suffer for their blindness, their follies, and their transgressions of right.

It does not redeem the situation that these kings and chiefs of industry are not chosen upon the hereditary principle (sometimes, alas! they are) but are men who have risen by their own capacity, sometimes from utter obscurity, with the freedom of self-assertion which should characterize a free society. Their power is none the less arbitrary and irresponsible when obtained. That a peasant may become king does not render the kingdom democratic.¹

This utterance seems unusually prophetic considering the new governments where peasants and house painters have made their way to the top. Large corporate businesses are in no sense private, individual businesses. They are economic governments, created by political governmental units such as the State of Delaware. As Henry S. Dennison has stated in an article entitled "Business and Government" in a recent issue of the *Michigan Alumnus*:

* * * The basic pre-supposition that business can be considered as an entity separate from government is wrong. * * * In the modern world a large number, often a considerable majority of the citizens, spend the most significant hours of their lives as part of the business structure. In so far, therefore, as business governs the lives of its people when they are working for it, business is, itself, a government within a government. Its possibilities of affecting the well-being and self-respect of its people for better or worse cover just exactly the ground which the democratic hypothesis claims as the primary and essential field of government.²

This position has been seconded by the noted political scientist, Prof. Charles E. Merriam, in a book entitled *The Role of Politics in Social Change*. I want to quote only one or two passages:

The great company assumes many of the characteristics of what is commonly considered a government. It has a legislative body, an executive, an administration, a department of state (public relations), a law department, a treasury, of course. It takes on many of the characteristics of what is called bureaucracy. The heads are invisible and intangible or tend to become so; they lose contact with their men; personnel divisions spring up; security of tenure becomes an issue, leading the way to pensions and other forms of insurance. * * *

With reference to their weaker rivals these great ones may lay down rules of action to which conformity is as important or perhaps even more so than compliance with the law itself. Manner and mode of production, prices, profits, areas of marketing—the whole gamut of production—may be swept by the benevolent supervision of the stronger.

* * * * *

¹ Reports of the American Bar Association, 1910, vol. XXXV, pp. 428-430.

² Henry S. Dennison, "Business and Government," in *Michigan Alumnus; Quarterly Number*, June 29, 1935, vol. 41, No. 23.

* * * If they do not raise armies, they can organize their own deputies into coal and iron or other police and carry on struggles in times of industrial strikes—little short of civil war in some instances; and they may also control the local organization of force and justice, or intimidate, if not own.

They may control the working conditions and hours of thousands of men, and, privately, shall we say, regiment their conduct to an extent not equaled by the organization known as the government. * * *

* * * Curiously enough, a corporation may obtain powers under the laws of some States, giving greater powers than the State government itself may exercise.

Furthermore, the relations between these larger units themselves become a problem of far-reaching importance to the community of which they are a part. Great "companies" may struggle and make war with each other within the boundaries of the State, as railway groups, or steel groups, or oil groups arise and contend for the mastery. At the same time comes battle with the smaller companies, concerns, and individuals, and the pressure of all of them upon the consumer and upon the worker and upon the state itself.¹

TECHNOLOGY AND PRESSURE GROUPS

Dr. KREPS. I propose for just a moment to look at the connection of technology and the increased power of pressure groups. There have, of course, always been pressure groups, groups with the same or similar interests, such as the aged, the veteran, farmer, laborer, banker, manufacturer. All have organizations. Being in the same group and hearing over and over again the same sort of experience, they easily identify what is to their own advantage with that which benefits everybody—and thus press for higher tariffs, consumption taxes, higher prices, higher wages, Federal subsidies, lower income taxes, and the like. These pocketbook interests soon develop into full-fledged matters of emotional principle. I think it is this that the cynic refers to when he defines politics as a battle of interests masquerading as principles. These "principles" then become the group mores not to be questioned internally and the basis for a friend-enemy classification externally.

Each such major economic group then brings pressure to bear upon legislatures for favorable legislation, and the resultant legislation often sets up a department, a bureau, a commission designed to minister to the needs and promote the interests of those whose initial pressures motivated the legislation. Thus, in housing, several distinct agencies exist here and abroad to represent, among others, the separate economic interests of the contractors, the building and loan societies, the advocates of governmental housing, and the owners who were threatened with loss of their homes. As a result there sometimes is frozen into the governmental structure the same sort of confusion which exists outside. But it is particularly in the modern era of specialization and of rapid communication brought about by technology that pressure groups have multiplied, and it is particularly in the modern era of large-scale production and savings that the individual interest at stake has become large.

Consumers are hard to organize because no one consumer will gain or lose a great deal either way, but large units may gain much and lose much. And large units, as has been shown, tend to have a technological foundation. Moreover, no one so easily or so readily raises the funds necessary for maintaining an organization as those

¹ Charles E. Merriam, *The Role of Politics in Social Change*, New York University Press, New York, 1936, pp. 49-52.

able to tax consumers directly through price maintenance. Good causes often go abegging. Thus technology has increased both the number and the power of pressure groups.

THE WORLD AN ECONOMIC UNIT

Dr. KREPS. Next, has technology made the world an economic unit? The extent to which technology has reduced the economic dimensions of the world is indicated in this exhibit.

The CHAIRMAN. The exhibit may be received.

(The chart referred to was marked "Exhibit No. 2443" and appears below.)

EXHIBIT No. 2443



EOTECHNICS

(to 1830's and 40's)

Best regular speed on land and sea 10 m.p.h.



PALEOTECHNICS

(late 19th, early 20th centuries)

Best regular land speed 65 m.p.h. best regular sea speed 36 m.p.h.



NEOTECHNICS

(present era)

Best regular speed in air 200 m.p.h.

TECHNICAL PROGRESS IN TRAVEL TIME

Size of the world, supposing best travel technology in each epoch were applied over the whole surface of the earth

Dr. KREPS. This is taken from Eugene Staley's *World Economy in Transition*¹ and is based on technical terminology taken from Lewis Mumford's book, *Technics and Civilization*.² Mumford calls the period which utilized wood as material and wind and water as sources of power, the eotechnic era. The size of the world in the 1830's is represented according to the best regular rate of speed on land and sea, about 10 miles an hour. The period beginning with 1800, which used coal, iron, and limestone, and mechanical devices, he calls the paleotechnic era. That, you see, is represented by the small size of the world, where the best regular land speed is 65 miles per hour, and the best regular sea speed is 36 miles per hour. The present age, in which chemical interaction, electric power, radio, and biochemistry are utilized, he calls the neotechnic era. You see the size of the world today, that little diminutive spot. The latter has been well characterized by a publication of the National Resources Committee entitled *Technological Trends and National Policy*,³ in the statement:

Four characteristic trends of modern manufacturing, (1) toward continuous processes, (2) automatic operation, (3) use of registering devices, and (4) of controlling devices are conspicuous.

(The chairman resumed the Chair.)

The CHAIRMAN. Have you, for ordinary folks, defined the meaning of these terms?

Dr. KREPS. Yes; I have; just before you came in. The eotechnic period is one which used wood for material and wind and water for power. The paleotechnic period is one using iron and steel for material and using mechanical power. The neotechnic period is the one we are in at the present time, of chemical interaction, and the like. I am describing some of the characteristics of this period as given by the Committee on Technological Trends.

The CHAIRMAN. Thank you so much.

Dr. KREPS. They point out:

The last two may embody the new electric eye or ear or only the older mechanical "senses." Or they may automatically make chemical tests, such as sampling furnace gas every few minutes for its proportion of carbon dioxide, to enable efficient and smokeless combustion, or measuring acidity, or chemical content by an automatic spectrophotometer.⁴

When you talk things like that, you are talking the neotechnic era.

Concerning the impact of technology upon nations, Mumford has made this, it seems to me, classic statement:

Both eotechnic and paleotechnic industry could be carried on within the framework of European society: England, Germany, France, the leading countries, had a sufficient supply of wind, wood, water, limestone, coal, iron ore; so did the United States. Under the neotechnic regime their independence and their self-sufficiency are gone. *They must either organize and safeguard and conserve a world-wide basis of supply, or run the risk of going destitute and relapse into a lower and cruder technology.* The basis of the material elements in the new industry is neither national nor continental but planetary: this is equally true, of course, of its technological and scientific heritage. * * * Under these conditions, no country and no continent can surround itself with a wall without wrecking the essential, international basis of its technology

¹ Eugene Staley, *World Economy in Transition*, Council on Foreign Relations, New York, 1939, p. 6.

² Harcourt, Brace, New York, 1934.

³ *Technological Trends and National Policy*, National Resources Committee, Washington, June 1937, p. 24.

⁴ *Ibid.*, pp. 24-25.

* * * Isolation and national hostilities are forms of deliberate technological suicide.¹

Thus it is that today measured in travel time, the whole world is smaller than the eastern seaboard in Washington's day or France in the reign of Napoleon.

Technology has been making for easier and larger movements of goods and persons across boundaries precisely at a time when nationalistic and pressure group politics seems bent on erecting walls to resist all these tendencies. The conflict of technology and politics is at the bottom of the present European mess.

Needless to say, from the point of view of raising living standards in the world, the forces of technology should be accommodated by the erection of a system of worldwide economic exchange which, through movements of capital and knowledge, or indirectly through trade in goods, would make every region more productive than it otherwise could be, and raise the income level of every country in the world.

While today population pressure, access to raw materials, and access to markets are fighting slogans in international politics [reading]:

One of the first principles for progress towards political peace as well as towards economic welfare must be: Lessen the economic significance of political boundaries.¹

according to Eugene Staley in his book *World Economy in Transition*.²

TECHNOLOGY AND WAR

Dr. KREPS. The way in which wars have been made more destructive by the use of machinery need not be emphasized. Despite the fact that wars are carried on only by governments, probably no machines have been so greatly multiplied or so rapidly improved as the machinery of death. In the first World War we already had repeating rifles, hand grenades, machine guns, heavy artillery, mines, submarines, bombing planes. Then new expedients such as steel helmets, tanks, chemical warfare, flame throwers, and anti-aircraft were introduced. Today we have the additional fact of motorization. But, due to the machine age or due to technology the destructiveness of war has increased not only on the battle front but (and here is the important point) on the home front. As Mr. Frederick Lenz points out in an article entitled "Influences of Modern War" in *Plan Age*:

The modern battle on land, on sea, and in the air, becomes the true counterpart of our peace processes. It exhibits all the characteristics of mechanized mass production and transport. It stretches the efficiency of standardized destruction to the utmost. Despite the human factor involved, it takes on an objective, measurable character; the role of the fighting soldier is analogous to that of the modern factory worker who acts as an accessory to the machinery of which he is in charge. Officers, non-commissioned officers, and privates represent the three typical strata of our industrial society.³

Modern industry and the military machine have in many ways the same characteristics. The preponderance of fixed capital investments is paralleled by the mechanization of modern armaments. Both, when in full action, consume durable goods, steel, copper, chemicals, and the like. Both require concentration and regimentation.

¹ Lewis Mumford, *Technics and Civilization*, Harcourt, Brace, New York, 1934, pp. 232-233; italics in original.

² Eugene Staley, *op. cit.*, p. 329.

³ *Plan Age*, November 1939, Vol. V, No. 9, p. 289.

tion of large numbers of human beings into compact units. In both the tendency toward rationalization is strong, and standardized patterns promote continuous replenishment of spare parts. Both tend to plan on a Nation-wide scale, map out campaigns, and rely heavily on propaganda, stressing heavily that they are only protecting their own.

The military is in fact the ideal form toward which a purely mechanical system of industry tends. It affords large-scale demand for absolutely standardized goods. Individual taste, individual judgment, individual needs other than the dimensions of the body, have no effect upon the clothing or equipment of the soldier—all are alike. Moreover, a nation at war is the ideal consumer. It makes large demands for steel and iron and machinery—that is, the durable goods recovery so much emphasized by certain analysts takes place—and then in the process of battle these are sunk or shot to pieces. No problem of overcapacity or resistance to replacement remains to block further sales.

Technology, in short, not only accounts for a good part of the increased physical suffering and loss of life in modern war but it shares no small part of the responsibility for the terrific economic, social, and political readjustments that modern war brings in its wake.

AMERICA UNLIMITED

Dr. KREPS. One of the inveterate pathological characteristics of periods of depression is the hue and cry that opportunities no longer exist, that the frontier is gone, that the pace of advance in the future is bound to slow down. So also at present. On the one hand, there are those who point to the small amount of virgin territory remaining to be settled in the United States, to the tapering rate of growth of the population—despite the fact that the number of families in the 40's is going to increase by a larger absolute amount than in any previous decade in our history—and similar factors. Not allowing for the fact that the human mind rarely can see as far and as distinctly in a forward direction as it can see backward, they sometimes argue that employment opportunities in the future are bound to be limited.

Such persons should study the recent industrial history of other countries such as Great Britain or Sweden.

I wish to submit as an exhibit, a chart from Carl Snyder's book entitled "The Remarkable Parallel of Sweden and the United States." It is the middle chart on the easel.

Acting Chairman REECE. It may be admitted.

(The chart referred to was marked "Exhibit No. 2444" and appears on p. 16263.)

Dr. KREPS. This shows a growth paralleling if not exceeding that in the United States. Moreover, the rate of increase in value added by manufacture in Sweden, precisely in the period from 1880 to 1920, is, if anything, faster.

Now Sweden in 1870 seemed to have no such frontiers ahead of it as did the United States. Here most of the area west of the Mississippi River remained to be settled. We were to go through in succession a rapid development of the iron and steel industry, two hectic decades of railroad building, and a new era of automo-

biles, construction, and road building. In Sweden the land was already occupied. Its population growth in no sense paralleled that of the United States. Moreover, from the point of view of the writer, Carl Snyder, who published this chart, Sweden was "handicapped" throughout the period by measures which have come into effect in the United States only in the past 7 years. To some of these measures or "handicaps" I should like to call attention.

EXHIBIT No. 2444



XXX. THE REMARKABLE PARALLEL OF SWEDEN AND THE UNITED STATES

SOURCE CAPITALISM THE CREATOR By Carl Snyder

They have had a reserve works system, a W. P. A., if you like, since 1866, based on a national resources survey made in 1852. They have about the lowest tariff in the world. They initiated a national power system under a water power administration in 1909, with scores of municipal and cooperative distributing plants (T. V. A.). A governmental power network gridirons the whole nation, with rural electrification covering 60 percent of the farms (as opposed to less than 20 percent here). They have had a managed currency since 1920 and frankly ignore the gold standard. The State is a

partner in the largest iron mines of the country, those now of such importance to Germany. Tobacco profits are used to finance old-age pensions, which they have had for decades, together with unemployment insurance and other forms of social security. The State owns the trunk line railways, the telegraph and telephone systems, and most of the forests. They have had the basic elements of the A. A. A. since 1928. Their systems of State liquor control compares favorably with that of any country in the world. Their governmental aerotransport company has not had a fatal accident in 12 years. They have had full collective bargaining for decades and since 1909, when Hjalmar Branting came into power (by the way, to settle a general strike which the King refused to stamp out by violence or bloodshed), Sweden has been governed most of the time by its L. O. (Landsorganisationen) with the slogan "The same possibilities for living securely within the fatherland for all those who inhabit it." They have had a consumer cooperative movement that successfully and aggressively reduced the prices of manufactured goods. In spite of all these "obstacles" Swedish manufacturing grew faster than that in the United States.

Those who consider Sweden a special case should look at developments in Germany, Switzerland, the Netherlands, or any other industrialized country, including Great Britain. Even in that tight little island the increase in real wages from 1840 to 1900 was just as rapid as in the United States.

I should like to submit an exhibit showing real wages in Great Britain and in the United States, 1840 to 1900.

(Senator O'Mahoney resumed the chair.)

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit 2445" and is included in the appendix on p. 17313.)

Dr. KREPS. Great Britain, I might say, has "suffered" similarly from free trade, full collective bargaining, and various forms of labor legislation. In addition to that, it has experienced a deficit in savings such that slightly more than half as much, that is only 7 percent, of the national income was saved in 1935 as was saved, 13 percent, before the World War.

What is the frontier that Sweden and England and many other countries have developed? It is obviously an intensive rather than an extensive frontier. It is the frontier represented by the needs and the will to progress of their own citizens. And that frontier still remains to be developed in the United States. As a notable business magazine, *Fortune*, points out in its issue of February 1940:

* * * The tools and extensions of industrialization do not exist for their own sake. They exist for * * * the consumer. The entire producers' goods industry, for instance, whose purpose is the making of tools, is quite secondary to the real purpose of industrialization. That real purpose may be defined as *an increase in the power to consume*. * * *

* * * The central economic problem is not a revival in the producers' industry, although that would help. Nor can it be a revival in "investment" in the old sense of the word. The central economic problem is simply the conversion of a high potential power to consume into an actual power to consume: a wider distribution of progress.

¹ *Fortune*, Vol. XXI, No. 2, p. 50.

The great differential that links potential and actual consuming power is *price*; and what the new era cries for is a drastic decline in many lines of industrial prices.¹

* * * Emphasis has been put on the need for confidence in making new investment; but * * * this emphasis is both unrealistic and academic. The realistic requirement is, rather, that the businessman should have *confidence in the consumer*; he must have confidence that if he decreases his prices and his profit margin he will get a corresponding rise in volume.²

* * * In the consumer lies the frontier. * * * By industrialization we built a new civilization. And during the last fifteen or twenty years, by further industrialization, we have created the possibility of an entirely new era for mankind. It is time now to get to work to make that era a reality.³

The magnitude of the frontier here to be explored is evident from the familiar pyramid showing income levels in the United States which was introduced once before at our hearings.⁴ I would like to refer to it now.

Dr. KREPS. It shows 8,000,000 families with incomes of less than \$750 a year, and an additional 11,000,000 families with incomes between \$750 and \$1,500 a year. These families, representing over 60 percent of our population, constitute a vast unexplored economic ore body open for the kind of pioneering effort which the Swedish and British have used throughout the past 50 years. Economic pioneers with vision are needed, able to get outside the shells of their prejudice and their self-interest. Here are some truly gigantic bridges to be built, economic bridges connecting the needs of these families with the goods which our superb machines can produce.

There are, in short, two frontiers—the industrial frontier and the frontier of economic adjustment. Changes in one must be synchronized with changes in the other, just like the front and back wheels of an automobile. If we vigorously push advances in technology and refuse to make the requisite economic adjustment, we will set up grave tensions in our society. Obviously to call a moratorium on research or on progress of the machine is both unwise and impossible. But the shortsightedness of those who argue that the industrial frontier is gone is only exceeded by the stupid defeatism of those who wish to call a halt to economic adjustment.

What is necessary is economic balance. Our capacity to produce goods must not change faster than our capacity to purchase them.

The CHAIRMAN. You should state that the other way, that our capacity to purchase goods should be kept in line with our capacity to produce them.

Dr. KREPS. Yes; I would agree to that.

The CHAIRMAN. Wouldn't you agree that that is a much better way of putting it?

Dr. KR s. There has to be give and take.

The CHAIRMAN. No; the one as you stated it involves the idea of limitation of production, and the amended statement which I have suggested does not involve limitation at all, it involves solely building up of the consuming capacity of these 19,000,000 families at the bottom of this curious diagram that you have presented.

Dr. KREPS. I agree.

¹ *Ibid.*, p. 160 (italics in original)

² *Ibid.*, p. 163.

³ *Ibid.*, pp. 145, 164.

⁴ See Hearings, Part II, pp. 5424, 5565

The CHAIRMAN. In other words, here is a potential market of 19,000,000 families which is unable to take full advantage of what advances technology offers, because they are living in the individual era, depending upon themselves, whereas all of the great triumphs of modern technology, or most of them at least, are the product of some form of organized effort, either in the development of the technology or in the use of it. Most of these great new inventions are capable of use only by some sort of collective effort. A railroad, for example, can be made to serve the people only by the collective assets, the capital of thousands of people, and the huge industrial army who operate the railroads. The same is true of every communication system. The same is true of the airplanes. The same is true of the modern system of public roads, and of the automobiles which travel those public roads.

These families at the bottom of the scale have not been permitted to emerge into the area of using what organized technology and organized industry makes available to them.

Dr. KREPS. That is correct.

It is interesting to note that even before 1932, a committee of President Hoover's, writing a two-volume work on social trends, should summarize their findings by saying:

If, then, the report reveals, as it must, confusion and complexity in American life during recent years, striking inequality in the rates of change, uneven advances in inventions, institutions, attitudes and ideals, dangerous tensions and torsions in our social arrangements, we may hold steadily to the importance of viewing social situations as a whole in terms of the interrelation and interdependence of our national life, of analyzing and appraising our problems as those of a single society based upon the assumption of the common welfare as the goal of common effort.

Effective coordination of the factors of our evolving society mean, where possible and desirable, slowing up the changes which occur too rapidly and speeding up the changes which lag. The Committee does not believe in a moratorium upon research in physical science and invention, such as has sometimes been proposed. On the contrary, it holds that social invention has to be stimulated to keep pace with mechanical invention.¹

Some of these social inventions have already been applied in American life. Our genius in inventing and exploiting the idea that all the children of all the people should be educated has led to an investment in plant in every corner of the United States and created jobs for millions. If we should catch the vision of building an American civilization, we could create employment for millions, as did Sweden, in providing, to use their national slogan, "more beautiful things for everyday life." In every city an art center, an opera house, with native schools of painting, sculpture, woodwork, handicraft, music, and literature; in every home and school and public building examples of native American artistry; but above all in American economic life a realization of that type of economic and social adjustment which may lead some future observer to call the United States, as Marquis W. Childs describes Sweden in his *Sweden, the Middle Way*, a—

country where *laissez-faire* has continued to exist; where the so-called "laws" of supply and demand have not been wholly invalidated by the spread of monopoly.²

¹ *Recent Social Trends in the United States*, McGraw-Hill, New York, 1933, p. XV.

² Marquis W. Childs, *Sweden, the Middle Way*, Yale University Press, New Haven, 1936, p. 161.

Monopoly in its various forms in the United States is *the* enemy of democracy. If we fail to have sufficient American pioneer red blood in our veins to insist that there shall be no concentration and exercise of economic power without the consent of the governed, technology will never be able to create for us an America Unlimited.

I am sorry to have taken such a long time, Mr. Chairman, for this testimony.

The CHAIRMAN. It was very interesting.

Do any members of the committee desire to ask Dr. Kreps any question?

Mr. HINRICHS. Mr. Chairman, may I have just a moment? There were one or two questions that I should like to have asked, but the hour is somewhat late and it has been somewhat difficult at points to follow this very interesting discussion. Merely as a matter of safeguard, therefore, I might want to question the witness at some later time.

I would like, however, to indicate what you already indicated at the beginning, that Dr. Kreps spoke in his personal capacity, and certainly was not representing, more particularly, the point of view of the Department of Labor in presenting what seems to me to be in part at least a bridge between the work which the committee has been doing and the present hearings, presenting it very interestingly and significantly. That is, in the discussion, for example, of concentration of economic power, of prices, with which the committee has heretofore concerned itself, I think in showing the relationship between those subjects and the broader problems of technology, Dr. Kreps has done a very real service.

I should like, however, if I may, to address myself for a moment to Mr. Anderson with reference to the type of interest which we feel in the Department very keenly, in the problems of technology or the machine as such. We recognize these other problems; our interest in America Unlimited is as unlimited as Dr. Kreps'. As a matter of fact, I think the phrase might conceivably have originated within our Department.

The CHAIRMAN. It is a good phrase, if more than one wants to claim it.

Mr. HINRICHS. It is an excellent phrase, and the more widely used, the better, and the more widely it is realized that America Unlimited means a very broad attack on the problem, and not a specific attack by restrictive measures, either with reference to production or with reference to machinery, presumably the better.

I have gathered from Dr. Kreps' testimony that an attack on the problem through a mere limitation on the use of machines as such would be regarded by many as analogous to the machine riot approach to machinery in the nineteenth century. Merely in passing, I would put in a footnote that I wouldn't want to make the statement before we closed an examination of the problem. There has been some interesting thinking by David Cushman Coyle and others, for example, as to the poverty a society may find itself in through an undue rate of obsolescence of machinery, where an undue proportion of its efforts goes into the creation of plants which are then scrapped and don't result in consumer goods.

But turning to the particular problems that are involved, Mr. Anderson, I hope that this is a bridge and not a forerunner of the

attack which is going to be made by all witnesses. This is fundamentally important, but there is the problem of the machine itself, of the group of workers that are thrown out by a specific machine, or the individual worker that is thrown out in the process of technological change, with reference to which we in the Department of Labor have a vital and continuing concern.

The things that we are hunting for are the constructive efforts which are being made by industrial leaders, by trade union leaders, by thoughtful people in the Government, as to the means by which that dislocation can be made less in those instances in which it occurs. It has meant, for example, in the recent past, a fairly substantial extension of the field of collective bargaining in which, for example, collective bargaining has concerned itself not merely with the question of wages and of hours, but has also concerned itself with such questions as the rate at which machinery is going to be introduced, and the way in which machinery is going to be introduced.

To take examples from countries that Dr. Kreps has been talking about, there has also been a very great interest in such things as dismissal wages, with which we in the United States have relatively little familiarity. Now there is a developing experience in the United States, and a developing awareness of the problem of the dislocation for the individual groups, on which we need to focus our attention, and to which hearings on technology and machines as such can very properly be directed, and should be extensively directed, to find out the extent to which there is an awareness, the extent to which that problem is being handled in one industry after another, and the methods that can be applied. And it is along that line that our Department has a very vital interest, that operates in a sense on a narrower level, or operates at least on an un-underlined level of interest, in that chart that was submitted, and I hope that we can look forward to that material and point of view being developed.

Dr. ANDERSON. May I express the attitude of the staff in building up these particular hearings, Mr. Chairman? We had in mind two approaches. The first one has been reflected in Mr. Kreps' fine document, and will be included in the next witness's statement of new and impending technology. On this first day we planned to orient ourselves in the problem, to get a glimpse of its size and its ramifications, to form this bridge between the larger social policy problems of the economic situation that you have been discussing through the year, and this more specific topic of technology as it applies in particular industries. Not only have we had in mind these specific points, but also as I pointed out this morning successive witnesses will be in the nature of case studies for the committee. Mr. Ford, for example, will be here on Wednesday morning, and he will discuss the whole retooling story of the Ford plant, the thing which every economist and labor man has been wanting to know about for a long time. Specifically in detail he will talk about displacement in particular units of the plant, and the effect of displacement upon workers, particular workers, in definite lines of production.

We have had in mind, therefore, a twofold purpose all the way through. The first task today was to lay a groundwork, as it were, upon which to build the rest of the structure. Ultimately we hope that out of this will come some sense of the social obligations, of the

policies of a social character, that must be formulated, and I have cautioned every witness with whom I have discussed the hearings that we do not propose to prejudge the outcome of the hearings in any way, nor do we have any formula or panacea. We intend to look upon them precisely as Mr. Hinrichs has outlined, a succession of case studies in which specific data will be assembled and presented to the committee for its review.

We are ready for our next witness, Mr. Chairman, if the committee is.

The CHAIRMAN. Did you want to make any comment?

Dr. KREPS. Just one statement, that I want to second what Mr. Hinrichs has said. As a witness, counsel had instructed me to say that I was speaking for myself, in no way committing anyone, and particularly in no way committing the committee as such, or any part of the committee. I am sorry if I failed adequately to carry out that instruction.

The CHAIRMAN. That is clearly understood, I think.

Dr. ANDERSON. Mr. Chairman, we are ready with our second witness for the day, and I might say we have scheduled the hearings on such a basis that you will have two strong witnesses a day to contend with.

Mr. Chairman, Mr. Watson Davis is the director of Science Service. He is the author of the book, *The Advancement of Science*. He has written many articles in this field, and, when looking over all possible witnesses to bring to you, on the subject of "New and Impending Technology," your executive secretary and I concluded that Mr. Davis was the best qualified person we could find. We present him to you with the subject of "New and Impending Technology."

The CHAIRMAN. Your testimony of course is all a matter of opinion, isn't it, and the result of your own studies?

Mr. DAVIS. Not only my studies, but those with whom I have consulted.

The CHAIRMAN. If there is no objection, we won't bother administering the oath to witnesses who are just contributing expressions of their opinion and of their own researches.

STATEMENT OF WATSON DAVIS, DIRECTOR, SCIENCE SERVICE, NEW YORK

The CHAIRMAN. Will you be good enough to state for the record your background, please?

Mr. DAVIS. My name is Watson Davis. I am director of Science Service. Science Service is a nonprofit institution for the popularization of science, with trustees nominated by five bodies: The National Academy of Science, the National Research Council, the American Association for the Advancement of Science, the newspaper profession generally, and E. W. Scripps estate. It has been in existence about 20 years, and it is operating in the field of keeping the public informed as to the advances of science. We operate in part as a press association or a newspaper syndicate and we publish the weekly magazine, *Science News Letter*.

The CHAIRMAN. How long have you been engaged in this work?

Mr. DAVIS. Approximately 20 years.

The CHAIRMAN. You may proceed.

Mr. DAVIS. The pace of research, invention, and engineering development shows no sign of lagging. On the contrary, science and the organized knowledge of the world seem to be proceeding at an accelerating rate.

It does not seem possible to predict with great definiteness exactly what new things the world will have in the years to come. But we may all be very sure that there will be new things, that we live in a world which will never be finished and is not static today, that most of the things that we wish to have can be obtained if we put our minds and our hands to the task. It is one of the important facts about our world today that we know enough and we have techniques sufficient to give us an extraordinarily good chance to develop through scientific research an answer to a need. We can usually make an invention if it is deemed sufficiently necessary and if brains and labor and money are turned to the task. As Dr. Kreps has noted in his earlier testimony, the art of invention has been invented.

The purpose of my testimony is to give some inkling of the things that men, looking into the future, believe we should be able to accomplish, things that once the people know might be achieved they will desire. Calling upon representative scientific research workers in various fields, my presentation will skim high points of what is being done to achieve these ends. Based on the record of successful research to date, we may be sure that what we set out to do in the field of research and invention we shall be able to accomplish in large measure sooner or later. With a broad and comprehensive look at great problems of the future, we should be able better to comprehend the topic the committee is now considering. It would appear rather definitely that these great problems will, in the immediate future, become more, not less, urgent.

First of all, just what is science and invention? I want to quote Sir William Bragg's advice to England at war because it is pertinent here in America at peace:

Science—

Sir William says—

which is knowledge of nature, is of fundamental importance to the successful prosecution of any enterprise.

Science is of general application. There is not one science of chemistry, another of electricity, another of medicine, etc. There are not even distinct sciences of peace and war. There is only one natural world, and there is only one knowledge of it.

Fruitful inventions are always due to a combination of knowledge and of experience on the spot.

MODERN INDUSTRIAL RESEARCH

Mr. DAVIS. The investigators engaged in scientific research are the remakers of civilization and the true molders of history. They may be called the catalysts of civilization. Now who are they, and where do they work? They are in our universities, in our Government laboratories, and in our industrial research laboratories. A few are on their own, working on their problems when the rest of us play bridge or go to the movies.

The CHAIRMAN. How many of them are on their own?

Mr. DAVIS. That is a very difficult question to answer. Perhaps your best index would be found in the patent record. I don't think there are any good reliable figures on that at all.

The CHAIRMAN. The general picture that has been presented to this committee in the patent study¹ and elsewhere is that which was mentioned by the previous witness, that an increasingly large proportion of research and invention is the product of group activity rather than of the activity of the single individual.

Mr. DAVIS. I think that is very true.

The CHAIRMAN. Fifty years ago it was common to have an inventor work altogether by himself. He may have been a student of chemistry alone, seeking to develop new chemical properties. But today would you say, from your experience, that the reverse is largely true?

Mr. DAVIS. Yes; the reverse is true, and even if the person is of such a nature that he actually is seeming to work alone, he very often, through literature or through contacts in other ways, is a part of a group, even if he brings about that group through consultation or consulting the literature and so forth.

The CHAIRMAN. It emphasizes the organizational aspects of modern society.

Mr. DAVIS. Oh, very much so; yes. Numerically, they are few, although their works bulk large in the fundamental reckoning of progress. Exact figures are lacking but perhaps not over 100,000 individuals are engaged in scientific research in this country. Perhaps a tenth of these, that is, 10,000, less than a hundredth of 1 percent of the United States population, strike with the flint of genius from the steel of learning the sparks that continually kindle anew the forward-moving torches of science and industry. Throughout the world perhaps 200,000 scientific investigators in the aggregate are engaged in the extremely important task of creating new knowledge and new technologic developments.

On industrial research in the United States, approximately \$215,000,000 was spent during the past year by 2,000 individual companies, according to a survey by Dr. William A. Hamor, Mellon Institute of Industrial Research's associate director. The survey showed that 32,000 scientists and engineers are engaged in industrial research, half of them in chemical, petroleum, and electrical laboratories. Some 16,000 more persons backed up these scientists and engineers as assistants or clerical workers. Leading investors in research during 1939 were du Pont, with a research budget of \$7,000,000, and Dow Chemical Co., spending \$1,400,000 on research. About 110 individual companies in the field of chemical industry and 40 trade associations make research grants to educational institutions. Approximately 200 college laboratories are used incidentally for industrial research and commercial testing. About 250 manufacturing corporations are sustaining long-range investigations in research foundations. Many companies with no laboratories of their own turn to the 250 commercial laboratories in the country.

I might say that these figures are rather round and there are inquiries under way which will come to fruition in a couple of months

¹ See Hearings, Parts 2 and 3.

which will probably refine them, but in general I think they are of the right order of magnitude.

In the universities and research institutions a considerable amount of fundamental research is done, much of which will eventually be of industrial and community value in a practical way. In the Federal Government laboratories much fundamental research is undertaken with the money available amounting to approximately \$35,000,000 a year.

Again, you can compute that figure differently if you define research differently.

Progressive, forward-looking industries are in the habit of making it a rule to spend from 1 to 3 percent of their gross income on research. Some large organizations in older industries spend almost nothing, while a few industrial concerns, born largely of research and development in recent years, are reported to spend up to 5 and even 8 percent of gross income in this way. The amount of money spent by the Government for research on a percentage basis is far less than that of the average industrial concern.

The CHAIRMAN. Do you mean on a percentage basis?

GOVERNMENT RESEARCH EXPENDITURES

Mr. DAVIS. The Government, on all its scientific educational activities, spends approximately, or did a few years ago, 1 percent.

The CHAIRMAN. One percent of what?

Mr. DAVIS. One percent of the total expenditures of the Government; therefore, the amount spent on research, using the same definition of research of an industrial laboratory, would be closer to 1 percent.

The CHAIRMAN. You wouldn't expect the Government expenditure for research on a percentage basis to be anything like that spent by ordinary industry, would you?

Mr. DAVIS. I would like to see it larger. The biggest job the Government has is taking care of the country as such, and that certainly is as important to the Government as the operation of industry.

The CHAIRMAN. Of course a good lot of that activity of Government is the constitutional duty of enforcing the laws which have been enacted from time to time.

Mr. DAVIS. That is true. Personally, I would like to see the Government spend more.

The CHAIRMAN. Surely; I can understand that.

Mr. DAVIS. I think it would be a very good investment from a practical standpoint.

Dr. ANDERSON. Mr. Davis, isn't it true that Government research enters a field that is not otherwise properly taken care of or adequately handled, and therefore is vital to fundamental research?

Mr. DAVIS. Yes; very much. The Government can do certain things in research that no commercial concern would be justified in doing. I think one example of that is the very extraordinary record of the N. A. C. A., the National Advisory Committee for Aeronautics, in aviation research, undertaking a job of development which industry certainly was in no position to do, and which has revolutionized the whole aeronautical industry to a remarkable extent.

The CHAIRMAN. Well, the ordinary commercial industry cannot undertake research except as an incident to its own enterprise. It must be upon a profit basis. The Government, on the other hand, can undertake research without respect to the profitable phase of it at all.

Mr. DAVIS. Well, it seems to me, Mr. Chairman, that the Government can look at research in very much the same way as an industry does. As a matter of fact, one of the most profitable methods of conducting research is to allow competent scientists to do the sort of things that they want to do, make the inquiries that they want to make, with the confidence that as they explore new fields of knowledge which may in some cases be very remote to the commercial aspirations of that particular concern, there will be enough new knowledge plowed up, and the results from a commercial standpoint will be sufficiently large, to allow that.

The CHAIRMAN. I assume that you would feel that the product of Government research should be contributed to the public.

Mr. DAVIS. Well, it will be of necessity; yes.

The CHAIRMAN. In other words, it would not be made the basis of a profit-making enterprise on the part of Government, but would be contributed to the public to be used by the public in whatever form seemed advantageous.

Mr. DAVIS. Some Government research might very well form the basis of a very profitable activity by commercial concerns.

The CHAIRMAN. Yes; but I mean you wouldn't want the Government itself to make profit out of the research.

Mr. DAVIS. The profit to the Government would be its service to the people. I don't see that it is the function of Government to make a profit in the industrial sense.

The CHAIRMAN. I wanted it to be clear that that was your point of view.

Mr. DAVIS. Research, in a very real sense, is international in scope. I think that is very important. It can be said that it is cosmic in scope, rather than merely confined to this earth. For what happens to a distant star or galaxy, when viewed by a giant telescope, may very well give an essential hint of how atoms act on earth, enlightening and explaining the way to some new industrial process.

As Dr. Raymond B. Fosdick, president of the Rockefeller Foundation, said in his annual report a few days ago:

Scientific growth is almost invariably the result of cross-fertilization between laboratories and groups in widely separated parts of the world. Only rarely does one man or one group of men recite with clear loud tones a whole important chapter, or even a whole important paragraph, in the epic of science. Much more often the start comes from some isolated and perhaps timid voice, making an inspired suggestion, raising a stimulating question, the first whisper echoes about the world of science, the reverberation from each laboratory purifying and strengthening the message, until presently the voice of science is decisive and authoritative.

Achievement in science, more often than not, is the result of the sustained thinking of many minds in many countries driving toward a common goal. The creative spirit of man can not successfully be localized or nationalized. Ideas are starved when they are fenced in behind frontiers. The fundamental unity of modern civilization is the unity of its intellectual life, and that life cannot without disaster be broken up into separate parts.

What is it that science and technology can do for us in the future? What developments can be brought about through research? It seems worth while to attempt to look at the future possibilities, in terms

of what representative scientific authorities believe can be done or what fields of research may prove to be fruitful to our industrial, personal, and national life.

Being a prophet is always dangerous. Yet those who in the past have made predictions of things to come have in general, curiously enough, been too conservative. I am referring to well-considered predictions by those who are competent to look ahead rather than the romancing of fiction writers.

FIELDS FOR FURTHER RESEARCH

Mr. DAVIS. In an attempt to obtain for this committee a well-documented and expert survey of fruitful fields for future research and invention, I have consulted with a number of representative scientists and engineers in this country. Since the National Association of Manufacturers at its recent Modern Pioneers Celebration selected a group of nationally recognized modern pioneers, men who are judged to have made major contributions to American industry from a research and engineering standpoint, this provided an eminent jury to which this problem might be put. Many of these men are very busy. Some of them are absorbed in a particular line of work to which they have made great contributions. Nevertheless, from this jury have been obtained valuable suggestions which I am incorporating in the material to be presented to you. There have also been consulted numerous authorities in various fields of research and their comments are being made available to the committee.

Eight broad or highly significant fields in which scientific and engineering developments should be particularly fruitful have been selected for exploration. These are, of course, just eight fields, and there are other important fields which, because of the limitations of time, can not be included. These fields are photosynthesis, atomic power, long-range weather forecasting, synthetic materials, chemical cures of diseases, genetics, human relations, and mobilization of scientific knowledge.

From the experts that I have consulted by wire I have gotten some comments, a few of which I want to include. Every one of these items represents extremely important fields of investigation and ones which will have very important consequences even in the very near future, in the opinion of Dr. V. K. Zworykin, director of the R. C. A. Manufacturing Co.'s electronic research laboratory.

This morning I have a wire from Dr. J. V. Dorr which states:

Your wire shows great vision. It probably understates possibilities and probabilities of the next twenty-five years.

In the opinion of Dr. William D. Coolidge, director of the research laboratory of the General Electric Co., Schenectady, N. Y. [reading]:

The experience of the past teaches us that for the future we have much more to hope from the things that we cannot even dream of today. Prior to the work of Faraday no one could have envisioned a dynamo, or before Roentgen an X-ray tube, or before Maxwell and Hertz a radio. These things became possible only after the fundamental facts and principles had been discovered. The most successful research organizations are those stressing the importance of fundamental research looking to the discovery of new facts and principles, which may not lead merely to improvements in old things but which may lead to entirely new ones. This of course constitutes an unlimited field for research.

A general comment on the relation of research to industry and general living has been made by Dr. Charles F. Kettering, who, by the way, is vice president of General Motors and general manager of the General Motors research division. In the record I had him president of the General Motors Research Corporation, an organization which has been dead as a corporation for 15 years, but very much alive from the standpoint of research.

On the question put to him he says:

It is impossible to predict specifically the effect research will have in shaping developments in existing industries, in creating new ones, and on general living. It is no more possible for us to tell what the next new industries will be than it was for Columbus to know that he would reach a new continent when he set sail to the West from Spain on a proposed journey to India. Even more important than his actual arrival in the West Indies was the fact that after he returned to Spain he still did not know that he had discovered a new continent. It took a hundred years of exploration after his initial voyage to have the new continent well defined.

And so it is with research; the only predictions that can be made are of the most general nature. Benjamin Franklin predicted that in time the doctors would know how to cure all diseases. His prediction is just as good today as when it was originally made. The doctors have made remarkable progress, but there are still enough diseases that they don't know how to cure to give them plenty of work over a long period of time before they succeed in fulfilling Franklin's prediction.

The CHAIRMAN. And to give the patients plenty of trouble.

Mr. DAVIS. Exactly.

This idea—

Dr. Kettering says—

of our inability to look ahead as to specific accomplishments is something that must be recognized and its recognition is as important as the actual research work itself.

Now, to take up these 8 fields: first, the field of photosynthesis.

The utilization of energy from the sun is a primary problem of mankind. The sun is fundamentally our chief source of available power or energy. Heat and electric power are derived from the sun whether it is generated hydroelectrically or by use of coal and oil. All food is manufactured by green plants through the use of sunshine. For ages men have fought for, literally, their places in the sun. The war in Europe is largely a struggle for the fossil sunshine of past ages, the oil and coal necessary to modern industry and living.

The problem of solar energy is a very large one. According to Dr. O. L. Inman, director of the C. F. Kettering Foundation for the Study of Chlorophyl and Photosynthesis at Antioch College, the best estimates are that the energy reaching the earth from solar radiation each year is equivalent to that received from burning 400 septillion tons of anthracite coal (4×10^{23} tons, or 4 followed by 23 ciphers). From this source mankind could draw plenty of available energy for all its needs.

The green plant is the principal converter of solar energy into useful material for mankind. The process by which it does this is called photosynthesis, although just how the plant does this is still unknown. Obviously, this is one of the major problems of our civilization. Yet a rough estimate by Dr. Inman of the amount of money budgeted in 1940 for this work in the United States is only about \$250,000 to \$300,000.

Dr. Inman sees two ways of approaching this problem so important to the long-time provision of power to our civilization: First, we could learn more about plant growth and grow several hundred times the amount of vegetation we now grow, transforming much of this into more condensed charcoal from which gas, oil, and so forth, may be made. Second, through fundamental research we could solve the mechanism of how to fix with the tools we now have available the carbon of carbon dioxide and the hydrogen of water into chemical compounds similar to methane or marsh gas and gasoline; or, by the addition of oxygen, to get sugar, woods, or fats; and, by the further addition of nitrogen, to get proteins and so on to thousands of possible compounds or molecules with energy stores ready for our use.

The CHAIRMAN. In other words, we may confidently look forward to the synthetic production of coal and oil and similar carbon products before the natural products have been exhausted.

Mr. DAVIS. If we get at the job soon enough and hard enough, because it is a big problem.

The CHAIRMAN. Progress is already being made, is it not?

Mr. DAVIS. Not too much progress is being made. It is relatively discouraging. But after all, there is only a handful of people who are really at work on this job at the present time.

Dr. ANDERSON. Mr. DAVIS, the point to be made is that it is realizable. In the opinion of this expert, this sort of a future is before us.

Mr. DAVIS. Yes.

Dr. ANDERSON. And the period of time involved depends upon the amount of money and the attention devoted to it.

Mr. DAVIS. It is a good bet that we will be able to do this in the future. How soon we are going to do it, no one knows, but certainly it is a very real problem for the future, and one that is worth working on, and if and when our supplies of coal and oil are exhausted, this may be one of the ways that we can take care of the energy resources of the world.

When man solves this problem of photosynthesis and sets up his own method of storing radiant energy from the sun, it may very well not be an exact duplicate of the method used by the green plant. And it is rather important that it may be even more efficient than the green plant is.

Dr. Inman says that man has been taking for granted that he can in some way keep on depending on capital stores of coal, oil, and gas for energy. He feels that the solution of the problem of photosynthesis in a practical way is a long-time research program, which is the point that you brought up, Mr. Chairman. If it is not started sufficiently early on a large scale, mankind may find that it was too late beginning the research, and serious shortage of power and energy supplies may be visited upon the earth by our failure to begin research even though we knew the job had to be done.

Mr. Chairman, I have here an expanded statement by Dr. Inman that I would like to submit as an exhibit.

Dr. ANDERSON. Mr. Chairman, the number for the record is 2446, and I submit this as part of Mr. Davis' testimony.

The CHAIRMAN. The exhibit may be received.

(The document referred to was marked "Exhibit No. 2446" and is included in the appendix on pp. 17313-17315.)

ATOMIC POWER

Mr. DAVIS. Turning to atomic power, within the atom there are as yet untapped stores of energy which if released would furnish almost unlimited amounts of power, enough to take care of all the energy needs of mankind. A mere 2 years ago the probability of the release of atomic power of any kind seemed fantastic. Early in 1939, the splitting of the heavy chemical element, uranium, with the release of an enormous amount of interatomic energy was demonstrated. Laboratories throughout the world that had "atom smashing" apparatus have been exploring as rapidly as possible with relatively limited resources this very exciting possibility.

The best opinion at the present time seems to be that which it may be possible to obtain energy from uranium on a scale of commercial importance for special uses, this type of reaction if made practical will at best tap only an infinitesimal fraction of the total atomic energy around us. The hope of tapping large amounts of atomic energy seems to lie in the possibility of discovering in the future a mechanism for atomic annihilation, in the opinion of Dr. M. A. Tuve of the Carnegie Institution of Washington's Department of Terrestrial Magnetism, one of the leading investigators in this field. Dr. Tuve, Mr. Chairman, has prepared at my request a statement on atomic power which I would like to offer as an exhibit.

The CHAIRMAN. It may be received.

(The document referred to was marked "Exhibit No. 2447" and is included in the appendix on p. 17315.)

Mr. DAVIS. Dr. William D. Coolidge, director of research laboratories of the General Electric Co., states:

It has been shown that in the case of the element uranium an enormous amount of interatomic energy may be set free, so much, in fact, that if further research shows how the process once started may be made self-propagating, we may be able to get as much energy from a pound of uranium as from millions of pounds of coal. This might prove to be a cheaper source of power than any other. Even if it were more expensive it might be revolutionary in those applications where weight and bulk are all important. It also seems possible that further nuclear research may show how the interatomic energy of some of the more common elements may be economically set free.

Dr. Lee de Forest, famous engineer, now resident at Hollywood, Calif., whose inventions have been so important in radio and motion pictures, states:

The cyclotron as developed by Prof. E. O. Lawrence, of the University of California, has already justified man's hope that eventually he will be able to derive by elemental fission cheap, universally obtainable energy in unlimited quantities. Our oil and coal resources must otherwise be exhausted within a few centuries. These must be conserved for more essential services than mere power supply.

Mr. Chairman, it happens that this morning there was announced from the University of California a gift from the Rockefeller Foundation which makes it possible to construct a new and larger cyclotron or atom smasher, and I have a statement of that which is being distributed today by Science Service, which I would like to make available to the committee.

The CHAIRMAN. Do you wish to incorporate it at this point?

Mr. DAVIS. I think it would be suitable, perhaps somewhat edited to conserve space in the record.

The CHAIRMAN. Very well, if you will cut it down and edit it, it may be received.

(The document referred to was marked "Exhibit No. 2448" and is included in the appendix on p. 17316.)

Mr. DAVIS. As in the case of the photosynthesis, the amount of research being conducted upon the problem of atomic power is extraordinarily small compared with the large winnings to mankind if success should be achieved. Most of the research is being undertaken in university and scientific institutional laboratories without any commercial objectives. On account of the extreme importance of adequate power to national economy and military defense, as well as to industry, adequate support of investigations of atomic power would seem to be a highly justifiable gamble.

SUGGESTED USE OF GOLD

Mr. DAVIS. In connection with the possible obtaining of practical power from uranium, the use of a few tons of the gold stored at Fort Knox, serving no useful industrial or scientific purpose, would be helpful. Such use of the gold would not involve its loss. The most practical methods that have been suggested of concentrating uranium is through thermal diffusion or through centrifuging. The uranium would be in the form of a complex gaseous fluoride which is highly corrosive to ordinary material but which is resisted by gold. If sufficient gold to construct the necessary apparatus could be loaned by the Government to research laboratories, this particular investigation would be very much speeded. The gold after the experiment could be returned to storage and even while in practical use would not lose its value as an asset in the United States Treasury. Perhaps some of the same gold that was prized by the Egyptian pharaohs could be used in this experiment since gold is one of the most imperishable materials on earth.

The CHAIRMAN. How much gold would be needed for an experiment of this kind?

Mr. DAVIS. Oh, a ton or two. It wouldn't be very much. It would be really just a loan of that gold, and you might have to loan a Treasury guard or a few soldiers to protect it, but even that wouldn't cost very much money.

The CHAIRMAN. There ought to be a headline in that: The witness proposes the Government loan two tons of gold. [Laughter.]

Mr. HINRICHS. Incidentally, it was an economist about 300 years ago who first suggested that gold might reach the point where it was going to have to be used as a commodity, and this seems to me to be an interesting demonstration of the cultural lag that it takes to make an inventive suggestion free.

The CHAIRMAN. I haven't looked at the Treasury statement this morning, but I am conscious of the fact that the gold at Fort Knox is measured in ounces, not in tons.

Mr. DAVIS. It might do a good deal more good in a scientific laboratory than at Fort Knox.

The CHAIRMAN. I wouldn't be at all surprised.

Mr. DAVIS. It still could be used to back up currency, of course.

The work on atomic power shows the internationalism of scientific research, and again I quote from Dr. Fosdick, that:

In the case of the breakdown of uranium during the past year, the early tentative questionings came from Rome; they were caught up at Berlin, were eagerly heard at Paris and Copenhagen, and then spanned the Atlantic and were seized upon here so enthusiastically that literally within hours, rather than within days, the critical experiments had been checked and extended at Columbia University, at the Carnegie Institution of Washington and in Lawrence's laboratory at the University of California.

There has been some fear that the sudden production of a new energy source of large magnitude would be economically disturbing. The experience has been that any development of this sort from a practical standpoint can be introduced only over a period of years even when it is once perfected. The benefits to the community at large from cheaper power would be so large that if and when atomic power or other power of low cost is achieved it would well be worth while to make the necessary economic adjustments.

Dr. ANDERSON. I wanted to ask a practical question bearing upon the subject of this hearing with respect to the time element of such a new, cheap power. When you say it would come in gradually, do you mean gradually enough for us to make the economic and social adjustments necessary to its use without a great loss?

Mr. DAVIS. I think that is a very difficult question to answer. I should think that if we had atomic power in such a way that you could apply it, probably it might take a decade to get it into such form that you could actually use it in a torpedo or automobile or some device of that sort.

From the experience that the world has had in making itself at home with innovations of a technologic sort, perhaps 100 years isn't too long. There might be a certain amount of difficulty.

Dr. ANDERSON. In other words, a 10-year span would be so short in terms of its far-reaching effects that some serious dislocation might occur from such a wide-sweeping thing.

Mr. DAVIS. Yes; it might in the same sense that dislocations have occurred through the use of radio, perhaps.

Mr. HINRICHS. May I ask a question in that connection, Dr. Davis. Does the practical application of a basic scientific principle, such as is applied here in the development of atomic energy, ordinarily make itself immediately available as a substitute in a whole series of fields, or does it become available in parts, as it were. Potentially we may need to think of readjusting our whole source of power supply with all of our mines, all of the people engaged in the production and distribution of electric power, all of the people engaged in the production and distribution of petroleum. A decade, two decades, for that sort of transition would be a terribly short period. I am interested to know whether in fact the practical application of the basic scientific principles does manifest itself over the whole field at once, or whether it tends rather to be a matter of a decade or so of development of one use, another decade in the development of another use, and so on.

Mr. DAVIS. I think it is on the order of a decade-for-a-use type of development. That is certainly true in radio. Radio came relatively slowly. That is, we had radio approximately at the turn of the

century, and we didn't have broadcasting until approximately 2, perhaps 3, decades later.

I should think, particularly if you began to use uranium, that is if you used the energy from uranium efficiently, that would be the first practical development. Nobody knows what will be the first practical development or whether there will be any, but if there is, that would probably be a very limited use. And if annihilation of the atom were achieved, that might bring about much more general use.

Dr. ANDERSON. Just to follow that for one moment, because it has some important bearing on the whole problem of technology, is it true that the state of our knowledge has come to a point where we are able to make the application much faster than we ever did before, and that there is some prospect of wide-sweeping changes occurring more rapidly than has been true in the past?

Mr. DAVIS. I think that is true. We are certainly getting certain applications such as sulfanilamide, which I want to talk about later, that have come in a good deal shorter time than such developments would have taken place a decade or two decades ago.

Mr. PIKE. You would see nations like Italy and Japan, which have no fuels of their own, who wouldn't wait two decades to put that into use.

Mr. DAVIS. No. They would put it in use once it was achieved. One of the amazing things is that the crucial experiment was done in Germany. Instead of being bottled up as a military secret, probably partly because they didn't know what they had, it was allowed to get out into scientific literature.

The CHAIRMAN. Mr. Davis, it is now 5 o'clock.

Mr. DAVIS. I will speed it up, Mr. Chairman.

The CHAIRMAN. I think that some of the members of the committee feel that this might be a good time to suspend for the evening.

Dr. ANDERSON. The schedule for tomorrow begins with Mr. C. F. Kettering in the morning, Mr. William Green in the afternoon. Mr. Kettering has promised to be here by 10 o'clock if the committee chooses to meet that early. But we can delay his presence a half hour or longer if Mr. Davis is to finish, because we should have Mr. Davis' testimony. I think the testimony ought to be in this order.

The CHAIRMAN. Yes; I think it ought to be in this order. Suppose we recess until 10 o'clock in the morning and have this witness proceed at that time, and he will then probably be in position to finish in half an hour or so, do you think?

Mr. DAVIS. I should think so; yes.

The CHAIRMAN. Unless there is objection, that will be the program. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 5 o'clock, a recess was taken until Tuesday, April 9, 1940, at 10 o'clock.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

TUESDAY, APRIL 9, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:15 a. m., pursuant to adjournment on Monday, April 8, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representatives Williams and Reece; Messrs. Hinrichs, Pike, O'Connell, and Brackett. Present also: Frank H. Elmore, Jr., Department of Justice, and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Are you ready to proceed?

Dr. ANDERSON. Mr. Chairman, we are proceeding with the witness who was on the stand yesterday afternoon, Mr. Watson Davis, who will continue his testimony on new and impending technology.

STATEMENT OF WATSON DAVIS, DIRECTOR, SCIENCE SERVICE, NEW YORK—Resumed

Mr. DAVIS. Mr. Chairman, we had gotten to the point in my testimony where we were considering atomic power. During the night an event has happened which might have some significance in that connection. The German occupation of Copenhagen brings perhaps into jeopardy one of the great centers of research upon atomic physics, the laboratory of Prof. Niels Bohr, and it is quite possible from a long perspective of history that it may be more important than some of the military consequences of the events that have occurred in the last few hours.

I had gotten to the point in the testimony yesterday where we were discussing the possible economic consequences of the production of new energy from a source of large magnitude like photosynthesis or the energy within the atom.

Because the problem of atomic power is in essence bound up with radiation of all sorts and atomic particles, attention is called to the future fruitfulness of more knowledge about electromagnetic radiations and atomic particles, especially the electron. The electron, the unit of negative electricity, is of course fundamental to the whole electrical industry with its wide ramifications, including radio, telephony, television, and so forth. There are many undeveloped possibilities in ultra-high frequency electromagnetic waves as a means of com-

munication, including television, frequency modulation broadcasting, and so forth.

A new field of great practical importance, in which the electron plays a major role, involves the use of streams of electrons as though they were beams of light. Dr. V. K. Zworykin of RCA, a pioneer in this field, foresees many important applications of electron optics to industrial and scientific problems. By means of a microscope that uses electrons instead of light radiation, the scientist is developing a means of delving further into the depths of things about us than is possible by means of visible or even ultraviolet light. The electron microscope promises to have important applications to biological, medical, and industrial research.

Atoms that are made to explode, artificially radioactive elements, a relatively new achievement in physics (the textbooks of a few years ago will state that radioactivity is found only in naturally occurring substances, in such elements as radium) are proving to be useful tools for research. Whether they will have practical industrial use is a matter for the future to tell.

Not only to explore the universe but to determine the fundamental properties of matter, the astronomer turns large telescopes to the heavens, where in the stars are found temperatures and conditions of matter which cannot be attained here on earth. From these explorations of the universe, much of our fundamental knowledge about the nature of matter has come, and in the future it can be expected that additional information of technological importance will be snatched from the heavens in this way.

It is conceivable, in the opinion of Dr. Lee de Forest, that we may be able to tap subterranean sources of heat in many localities for power and heating purposes. A long-term heat-storage discovery or invention might permit us, in his opinion, to store and use solar energy in enormous quantities, but today he sees no promise of such. Adequate fuel crops are conceivable but Dr. de Forest believes that climatic vagaries would seem to make this uneconomical.

The direct conversion by combustion, of coal into electricity is a possibility upon which some research is being done. If this were accomplished efficiently the present round-about method of power production, burning coal to make steam for use in engines or turbines which in turn drive dynamos to generate electric power, would be replaced by a direct one-step process.

LONG-RANGE WEATHER FORECASTING

Mr. DAVIS. Turning to the problem of long-range weather forecasts, the weather is so important to the conduct of everyday affairs, industrial activities, and human activities in general, that knowledge of what the weather is to be in the future is of immense practical importance. At present the weather forecasts issued every 8 hours covering up to 2 days in the future are so much a part of our daily life that we take them for granted. The providing of these forecasts by the U. S. Weather Bureau is one of the most important of governmental functions.

The prediction of what the weather will be weeks, months, and years in the future is one of the important problems still to be

solved. If it were possible to know what the weather was to be next year, or several years from now, whether the growing season in various regions was to be satisfactory or unsatisfactory, whether the winter was to be abnormally cold, whether there was to be too little or too much rain, the savings to agriculture, industry, and the nation would be very large. Such information would be of great use in planning personal activities in the future. Both supply and demand of commodities are greatly affected by weather conditions, and long-range predictions that would reduce the hazard due to weather would be of great benefit. On a national or international basis reliable knowledge of the weather to come would allow the Government and business to make plans for meeting changing conditions, which without long-range weather forecasting, assume the shape of emergencies. Disastrous famines might be averted. Unmanageable agricultural surpluses might be reduced.

Research and progress on this problem holds out the hope that with enough work, adequately supported, there is a good chance that weather forecasts considerably further in advance of what is now possible will be developed. Prediction of the seasonal trends may be possible for years in advance.

Prediction of the weather as a general public service has been a function of the government in practically all parts of the world. Long range weather forecasting could hardly be considered the foundation of an extensive industry itself, but business and industry will benefit to a large extent when and if the long-range forecasts are possible.

Trends in long range forecasting research are shown by the following developments, made known in statements obtained from representative investigators:

"Short" long-range forecasts for 5 days in advance, on an experimental basis, have been made by the United States Weather Bureau during the past 2 years, based on a combination of statistical studies, synoptic techniques, and physical theory of the general circulation of the atmosphere. These forecasts have been subjected to rigid verification tests and have lately become sufficiently successful to warrant a broader try-out.

The extension of present forecasts from 2 days to 2 weeks, and the making of forecasts of temperature and precipitation for seasons and even years in advance, on the basis of solar radiation, are considered possible by Dr. C. G. Abbot, Secretary of the Smithsonian Institution, as the result of extensive research.

Long-range forecasts for the United States are considered possible for the future by Dr. Charles F. Brooks, director of Harvard University's Blue Hill Meteorological Observatory, but he feels that the problem is no easy one and would take much work at great expense to solve to a generally useful point. The value of such forecasts, however, would far exceed the cost. In one study of world weather it has been found that conditions in the Southern Hemisphere indicate subsequent abnormalities in the Northern Hemisphere more often than do antecedent conditions in the Northern Hemisphere itself.

I have here, Mr. Chairman, statements on behalf of the U. S. Weather Bureau, Dr. C. G. Abbot, and Dr. C. F. Brooks, which I should like to submit as exhibits.

The CHAIRMAN. They may be received.

(The document referred to was marked "Exhibit No. 2449" and is included in the appendix on p. 17316-17319.)

Mr. DAVIS. In the opinion of Dr. Lee de Forest, universal stratosphere flying and better interpretation of information obtained from radio transmission phenomena, cosmic rays, sun cycles, and earth-wide meteorological data will enable twenty-first century man to reliably forecast long-range weather conditions for agricultural and other planning.

Turning to synthetic materials, bountiful as Nature has been in supplying the earth with materials useful to man, research and invention have created important synthetic materials, many of them unknown in nature, which play extremely important parts in our daily economy. Many of these are familiar to us in our daily life: drugs, dyes, and chemicals from coal tar, a multiplicity of plastics or synthetic resins, alloys of iron and other metals, rayon, and so forth. In the field of textiles or fabrics alone in the last few years, chemistry has given us nylon, a silklike synthetic fiber made basically from coal, air, and water; vinyon, another synthetic fiber; synthetic wool, made from casein of milk or other protein; and even fibers of glass. Clay has been transformed into a synthetic mica which potentially makes us free from overseas export of this essential mineral needed by industry.

For the future, particularly if power is obtained by discovering the secret of photosynthesis or from within the atom, it may be considered a crime against society to burn coal or oil for power or heat, because their chemical constituents are so much more valuable than their energy content.

On behalf of the General Motors Research Laboratory, in a comment on the possibility of extended chemical utilization of oil and coal, prepared by T. O. Richards, head of the laboratory control department, it is declared:

Oil and coal have long been considered as finished products that only needed a certain amount of refining to put into commercial form. Within the last few years petroleum particularly has come to be considered as simply a source of chemical compounds which can be torn down and built up and rearranged into particular compounds of specific commercial value. The utilization of coal as a raw chemical material to be used as a building block for chemical compounds has barely begun, but it will become an important chemical industry. Just what products will be made, we don't know.

Du Pont comments as follows in a statement on this possibility prepared by Theodore G. Joslin, director of public relations department:

In our judgment, coal and oil will serve as valuable sources of raw materials for the synthetic organic chemical industry. It is our belief that there will be great developments in the future, but we do not see the future clearly enough to want to speculate for publication on what these possibilities will be. Beyond any doubt, many millions of dollars will be spent on research in connection with these problems, but it is impossible for anyone to make an accurate estimate.

The artificial production of diamonds is a possibility foreseen by Dr. William D. Coolidge, director of the research laboratory, General Electric Co. Such an accomplishment would be of great industrial importance and the production within the last few months of high pressures in the order of 3,000,000 pounds per square inch is a step in this direction. Dr. Coolidge states:

Diamond, the hardest known substance, would have much more extensive use as an abrasive material for grinding operations and for rock drilling if it were

less expensive. Through research on the effect on graphite of high pressure combined with high temperature it might be possible to learn how to make diamond artificially and relatively inexpensively.

The production of refractories which would withstand higher temperatures than the furnace linings now available would be of great industrial importance. Failure of the furnace linings is now the controlling factor in the production of high temperature industrially. With respect to this problem Dr. Coolidge says:

Power from coal or other fuels could be produced more economically through the use of steam or other vapor if higher temperatures and pressures could be employed. We are now limited by the high temperature strength of present metals. Current metallurgical research indicates possibilities in this direction and the importance of the problem warrants much further research effort.

Common building materials are susceptible to considerable improvement, as these two observations by Dr. Coolidge will indicate:

Present research on road materials is showing how the life of a pavement may be economically increased. Further research in this direction should lead to improved highways with all that this means in better living conditions and in the strengthening of our national defense.

Further research on plastics and other materials is certain to contribute greatly to the solution of our important housing problem.

METAL ALLOYS

Mr. DAVIS. The science of metallurgy has only begun to tap the vast domain of metal alloys. There are millions of combinations of metals possible that are not yet investigated. Only about a thousand alloying combinations of metals have been studied and most of these are inadequately investigated. Millions of binary, tertiary, and quaternary alloy systems still need investigation. Among them there undoubtedly many hundreds of combinations which would be striking improvements over alloys now in use.

Some of the unusual metals being used in alloys will give indication of the possibilities for improvements in metals in the future. According to information supplied by Dr. Oscar E. Harder, assistant director of the Battelle Memorial Institute, Columbus, Ohio, the unusual new elements being used in steel include silver, titanium, tantalum, columbium, and vanadium. These elements are being used in stainless steel. A columbium-containing heat-resisting alloy has been patented recently. Silver is used in bearing metals, as is cadmium. Tantalum and columbium are being used as pure metals and as the carbide for making bonded carbide tools. During the past few years high-speed tool steels in which molybdenum has replaced tungsten in whole or in part have been developed to where they are accepted by industry. Metallic manganese is being made by an electrolytic process.

The old dream of the alchemists, transmutation, has been achieved in the scientific laboratory. Although relatively small amounts of one element have been changed into another, almost every element has been transmuted into some other element. This holds out the possibility that in the future when large amounts of power are available, and when more is known about the constitution of the elements, it will be possible to manufacture the rare elements from the common elements.

As Dr. Lee de Forest puts it [reading]:

Today's astonishing, although as yet meager, atomic transmutations abundantly justify the hope that eventually we may be able to manufacture all rare metals from those more nearly inexhaustible and located within our reach.

He adds that—

many other elements will soon be in the rare category if present rates of consumption continue.

CHEMICAL THERAPY

Mr. DAVIS. Turning to the chemical cures of disease, the remarkable success in the use of sulfanilamide and its related chemical compounds in treating a large variety of diseases, some 40 different sorts, focuses attention upon the possibility of further chemical cures of disease in the future. While the results obtained with the sulfanilamide chemicals are truly remarkable—they have changed the routine method of treatment of many diseases—there are still many diseases of economic importance that are not successfully treated. There is hope that chemotherapeutic agents can be developed for the control of infectious and other diseases not now successfully treated.

The economic loss due to illness is appalling. The manufacture and distribution of drugs to be used by physicians is in itself a large industry. It is evident that there are many economic implications in the treatment of disease and the problem of human health.

A healthier population which will result from the application of medical advances should be an economically more secure and effective population, capable of greater consumption and production. A slowing population growth, undesirable from the standpoint of consumption of industrial goods, may be counteracted to some extent by the lengthening life span and the ability of individuals to engage in active work during a longer period of their life.

Despite the advances in medical treatment, there are non-infectious ills such as cancer and heart disease that are unsolved problems.

In the opinion of Dr. Perrin H. Long, of the Johns Hopkins Hospital in Baltimore, who brought sulfanilamide to America, there are still chemotherapeutic advances to be made. He states:

While great advances have been made in the chemical treatment of bacterial and parasitic diseases, there is every reason to believe, if research is prosecuted vigorously in the laboratories of the chemical and pharmaceutical companies of this country, that more effective chemical compounds can be elaborated for the control of infectious diseases, for example: We still do not have as effective drugs as we need for the control of infections caused by the typhoid-colon group of bacilli, the staphylococci, and we have nothing that affects such diseases as the common cold, influenza, infantile paralysis, or the other virus diseases. All of these problems ought to be attacked. I can not estimate how much money is being spent on chemotherapeutic research in this country at the present time, but my rough guess would be in the neighborhood of 2½ to 3 million dollars, that is, if one leaves out or does not consider the experimental work that is being done on syphilis.

About 20,000 substances related to sulfanilamide have already been made, according to Prof. Paul D. Lamson of the Vanderbilt University School of Medicine. The task of trying all these on diseases in which they may be helpful is a gigantic one. In Professor Lamson's opinion, we are for the first time faced with a public which has come to see that cures can be produced with chemical substances. The public is beginning to see that something can be done about the

problem of disease and that the time has come to do it. In Professor Lamson's opinion, investigation should be conducted to find out how the animal body works, by using chemical substances as exploratory probes, thus giving the knowledge needed for the development of better treatments of disease.

In recent years the chemical nature of vitamins and hormones has been discovered and many of them have been synthesized. Striking cures of diseases have resulted from the use of vitamins and hormones therapeutically. One of the latest disease conquests has been the abolishment almost overnight of the bleeding tendency in jaundice patients who have to be operated upon, by injections of the new synthetic vitamin K.

According to Dr. Walter Simpson, of the Miami Valley Hospital, Dayton, Ohio, in a communication transmitted by Dr. Charles F. Kettering, experiments now under way indicate that by combining relatively large doses of arsenic compounds with artificial fever it may be possible to reduce the minimum time for the treatment of syphilis from 18 months to a few days. When the treatment for syphilis becomes simpler and cheaper, we shall be well on our way toward the eradication of this great destroyer of mankind.

Statements by Dr. Simpson on vitamin K, pneumonia, syphilis, and malaria are made available to the committee, and I would like to offer these as exhibits.

(Senator King assumed the chair.)

Acting Chairman KING. They may be received.

(The document referred to was marked "Exhibit No. 2450" and is included in the appendix on pp. 17319-17320.)

Mr. DAVIS. To an even greater extent than in many other fields, the development of medical research is an international undertaking. This is shown vividly in the case of the sulfanilamide compounds. The first hint of this amazing development came in connection with the dye industry in Germany, and the drug actually was shoveled around an industrial plant for years before its medical usefulness was discovered. German, French, British, and American institutions all played important parts in the development of this drug, which has brought such brilliant results in the treatment of disease.

GENETICS

Mr. DAVIS. The living plants and animals that populate the earth constitute one of our most important natural resources. Primitive man, by selecting the best plants and animals for his purpose and allowing them to perpetuate themselves, made remarkable advances in quality and usefulness of his crops and his livestock.

Since the turn of the century, when the scientific fundamentals of genetics began to be known, this process of scientific breeding of both plants and animals has been greatly speeded. The superior grain, fruits, and vegetables, the more efficient animals, from the standpoint of milk, the improved meat and wool production that the farmer now has, are indications of what can be done through this improved process of invention applied to living things.

In recent years the role of man's part in invention of new plants has been recognized through the inauguration of plant patents

Industry has always used to a large extent the products of the farm and forest, but there is an awakening realization that agriculture can furnish more of the raw materials of industry than it now does. Improved crops and animals will play an important part in this promising movement.

Promising possibilities for further advancement are seen by scientific investigators working in the field of genetics.

Dr. A. F. Blakeslee, director of the department of genetics, Carnegie Institution of Washington, Cold Spring Harbor, Long Island, N. Y., states:

Scientific plant breeding, known as genetics, is responsible for the conscious development of superior types of plants and their preservation against the ravages of disease and other unfavorable conditions. The economic value could be cited of crossbred seeds in corn which gives increased yield from hybrid vigor, hybrid vigor in forest trees, the development of rust-proof grains and other disease-proof crops through hybridization and selection. Genetics is at the basis of improvement in the present wide range of agricultural and horticultural forms. In the future, genetics will play a greater role than in the past, with ability to control increase of chromosome number by such stimuli as colchicine and by other methods, new species and variety will be made up in order to meet special needs. In ways and to an extent impossible to imagine at the present time, I believe geneticists will exercise conscious control of evolution to the betterment of mankind. Important sources of raw material, such as cellulose from cottons, paper pulp, and cornstalk waste, as well as plants as sources of food, are all controllable by genetics methods.

Dr. E. D. Merrill, administrator of the botanical collections of Harvard University, Arnold Arboretum, Jamaica Plain, Mass., states:

It is very difficult for one to indicate the tangibles in genetics in reference to plants and plant breeding. I personally doubt if any new major industries can be developed on the basis of research in this field; but, manifestly, many existing industries could be increased in importance by the utilization of existing and potential knowledge within the general field of genetics and plant breeding. New significant social developments could hardly be expected, but the increased utilization of knowledge in industry would have a very favorable reflex action on our whole social set-up. I would be inclined to forget genetics as genetics, and emphasize plant breeding. Too many individuals are working on abstruse phases of the general subject of genetics, and too few well-trained men are devoting their efforts to the actual problems of breeding plants for resistance, adaptability, yield, and other similar factors.

Prof. M. F. Guyer, professor of zoology of the University of Wisconsin, states:

The application of genetics to domestic animals is very important from the standpoint of resistance to disease. The genetic constitution of the host is no less important than the nature of the invading germ. Many investigations indicate this. The work should be greatly extended.

Dr. W. C. Curtis, professor of zoology of the University of Missouri, states:

Considering that all our most important knowledge in genetics has been acquired since 1900, it is not surprising that practical applications are just beginning. With the theoretical foundation now established and being rapidly extended, it will be surprising if important applications are not forthcoming in the next few decades. Such has been history in all branches of natural science once the basis has been laid in fundamental knowledge. Such applications have already been made in many instances in domesticated plants. Applications to animals are more difficult but are on the way. The possibilities of human applications with advancing knowledge are very great within the limits that such knowledge can be applied to human beings.

It is possible that in the years to come the greatest contribution of genetics to our society will be the conscious evolutionary improvement of our human population that it will make possible.

The way in which human beings get along with each other, at work and in general living, is perhaps the paramount problem of industry and the world at large. Human relations in the factory, in the community, and in the home, might not seem to be at first consideration a problem for research and technology. As a matter of fact, it seems probable that the methods of scientific research applied to this great problem in which the reagents are human beings will be capable of producing useful and fruitful results with as much assurance as they do in less animate fields. Admittedly, the difficulties in this field are larger because we are dealing with ourselves and we always feel that we know all there is to know about ourselves.

Man, as an individual and in the group, is the subject of investigation by psychologists, psychiatrists, teachers, administrators, and others who deal with various human problems. It would seem logical that some of the findings in these fields might be applied profitably to the difficult relations in the fields of business, politics, and international affairs. Any scientific developments or researches that would minimize the conflict between labor and management in industry would be likely to pay large dividends. Any scientific inquiries that would be likely to minimize the chances of economic and military conflict between nations would likewise be very profitable.

I have turned for an analysis of the situation with relation to the problem to Dr. Elton Mayo, professor of industrial research of Harvard University's Graduate School of Business Administration. He sees three outstanding present and future problems in industry and general living. They are: better human relations, executive authority, and unemployment. He finds the amount of research being done on these problems so small as to be negligible. It is only the obvious aspects of the difficulties that are being studied, and the various inquiries deal only with palliative measures for the symptoms instead of diagnosis of malady.

I have a statement from Dr. Mayo I should like to submit as an exhibit.

Acting Chairman KING. It may be received.

(The document referred to was marked "Exhibit No. 2451" and is included in the appendix on pp. 17320-17324.)

Mr. DAVIS. This material from Dr. Mayo is particularly pertinent to the subject under discussion by the committee because of the fact that it does go into the human basis of conflict between employers and employees, and I think it is worthy of rather detailed consideration. However, I am not going to take the time of the committee to read these quotations.

I have an excerpt from a document by Lawrence K. Frank that I should like to offer as an exhibit that discusses the background of conflict.

Acting Chairman KING. It may be received.

(The document referred to was marked "Exhibit No. 2452" and is included in the appendix on p. 17325.)

Mr. DAVIS. I should like to call to the attention of the committee the very difficult problem of the mobilization of knowledge.

SPREAD OF TECHNICAL PROGRESS

Mr. DAVIS. With the accelerating pace of scientific research, invention, and development, the distribution, interpretation, and utilization of the knowledge already obtained become increasingly important problems.

The normal way of announcing a scientific discovery is to publish a paper in a scientific journal or the report of a scientific institution. An invention is made public through the issuance of a patent; in effect, the inventor tells the world what he has done in exchange for a monopoly of his invention for a limited time. Scientific meetings and conferences are an effective way of exchanging scientific information and results.

There has been built up through the years a vast and complex scientific literature containing the results of past researches. These journals, books, reports, etc., are accumulated in libraries. The channels of publication are relatively adequate. It is usually possible for any important scientific contribution to be published in at least abbreviated form in a scientific journal. The facilities for keeping on file in libraries the scientific literature are also relatively adequate.

The great failure of our organization of our written knowledge lies in the inability of anyone to put his finger upon all the literature on a given subject with relative completeness and at a reasonable cost. Our organized knowledge as contained in the printed literature is extraordinarily poorly indexed from the standpoint of its efficient utilization.

In a few fields, such as chemistry, there are abstract journals which do an invaluable job. But in many fields bibliographic resources are quite inadequate, resulting in investigators not being able to discover what researches have been made in a particular line of inquiry in the past.

New mechanisms recently developed, or in the process of development, which may be called new tools for intelligence, are likely to prove useful in this needed mobilization of knowledge.

The card index was a major invention in connection with scientific information services. Of similar usefulness is microfilm, reduced-size images on photographic film, which can produce with facility and low cost single copy editions of anything that a camera lens can see. Microfilm is in practical use, making available to scientific workers copies of articles in libraries which they need in their researches. It is also being used to publish upon demand extensive research reports which it is not practical economically to print in extenso and distribute widely.

With mechanical and photographic devices already existing, under development, or capable of being developed in the future, the marshaling of the scientific and technical knowledge of the world so that it may be used to the fullest extent would seem to be a project that could be contemplated if the need were realized, attention were given to the problem, and means were available. It would be of immense benefit to the world to create what H. G. Wells has called engagingly a "world brain."

Most of the scientific literature has been listed by title or abstract bibliography somewhere in abstract journals or in special bibliographies or large card compilations. Microfilm would make it possible to multiply the cards under various subject classifications and to copy them for distribution to the scientists and inventors that need them. A great many fields of development would come to fruition in such a project. This is a large project that will require cooperation between different kinds of research workers and even between different nations to make it effective. It is of such magnitude that it is probably a matter for public rather than industrial support. The cost would be considerable but the returns to industry and the community at large through the speeding up of research and invention would make the project a very profitable undertaking to the community at large.

Better coordination of research and the exchange of information about research in progress between investigators will also help in our mobilization of human knowledge.

It is very important that the public be informed about the progress of science and invention and the possibilities of further advances. Cooperation of the press and other media of distribution of news and information is essential in this connection.

Acting Chairman KING. Thank you very much. Are there any questions?

Who is your next witness?

Dr. ANDERSON. In calling the next witness, I might refer to the closing remarks of Mr. Hinrichs yesterday and outline once more the issue of these hearings. We have had in mind not only the oral hearings conducted with your questioning, but the published record. In doing so, we have devoted the first day, yesterday, and half of today, to the general topic under review. We have called, in the first place, an economist to give a detailed statement of what technology looks like in terms of economics. You have now had Mr. Watson Davis, who is a scientific writer, who has outlined the scope of impending technology, and we wish to call now a man whom we selected with great care, Mr. C. F. Kettering, vice president of General Motors Corporation, and general manager of the Research Laboratories Division of General Motors. We bring him before you as the third member of this general review section, to speak as an industrial engineer on the topic that he knows best—technology and the social economic horizon.

Mr. Kettering has prepared a statement which is submitted to the committee at this time, and I understand his secretary will read that statement to the committee as the opening of his remarks. Mr. Kettering has been before the committee before and you know him so well that he doesn't need an introduction. I know his lively treatment of the topic will call forth a great deal of questioning from many. We begin with his statement, and then, as Dr. Kettering says, it is up to you, and he is at your disposal for any questions.

Acting Chairman KING. The committee is well aware that Dr. Kettering has been before the committee, as you have indicated. It isn't necessary that he be sworn again.

STATEMENT OF CHARLES F. KETTERING, VICE PRESIDENT, GENERAL MOTORS CORPORATION, IN CHARGE OF RESEARCH, DETROIT, MICH.

Mr. PAUL GARRETT, secretary to Mr. Kettering (reading):

We have been accused of producing unemployment by too many inventions, yet the facts are that we haven't enough new things to provide sufficient jobs for all of the people who want to work. Someone said years ago that necessity is the mother of invention. Necessity for invention *then* was to produce machines and devices which would save human labor because there were so many more things to do than there were hands to do them. Today, necessity is again calling on the inventors to produce new things, because we have more hands than we have jobs to do.

We know that this call for new products from the inventors and industries will not go unheeded. Many of these products will come directly from a system called industrial research, a process which is American through and through. This is a process of cooperative invention and it will surely bring into our industrial machinery many new products and improvements.

In the field of automotive transportation, with which I am most familiar, we are not even predicting when you hear that the next ten years will show a rate of improvement greater than that of the past ten years. This fact is established as clearly as anything in the future can be established. Scores of research projects are now under way in the industries which make automobiles, trucks, buses, tractors, airplanes, and Diesel locomotives. This is also true in every one of the industries which make and supply the materials for our industry, such as petroleum, rubber, steel, fabrics, chemicals, etc. Success in only a small percentage of the projects now in mind will give American workmen thousands of new jobs and will increase the value of the transportation dollar more than can now be realized. Statistics show that of the millions of people who earn a living in the automotive transportation business only about 10 percent are employed in making the vehicle.

In research laboratories all over the country we now have men who are learning to think. In the management of the automotive and associated industries, we have enlightened executives who have learned how to spend money to give research men the *opportunity* to think. They are providing the tools to make ideas come alive.

I like to think of this mass production of ideas as a team play in an immense effort to readjust our economic system so as to put to work our excesses of men, money, and materials. Our team includes many men, many companies, many industries.

Speaking from my own experience, I think particularly of the automobiles of tomorrow, the airplanes of tomorrow. They are being built right now in secluded laboratories by specialists in fuels, metals, ceramics, rubber, plastics—by designers of engines—by petroleum technologists—by others who are devoting their lives to improving such humble but indispensable engine parts as valves and fuel pumps, lubricants and gasoline, for these oil products are now as much a part of the engine design as the crankshaft and pistons.

Progress encounters new and more difficult problems. Each year the road ahead is steeper. When Orville and Wilbur Wright made their historic flight of 120 feet in 12 seconds, they had to think only of the process of flying, but now, just 36 years later, when you buy a ticket to Europe the company which operates the airplanes has a thousand additional problems and it has to take the question of successful flight for granted. But we in America take progress on this road for granted, as we also take for granted blessings unknown anywhere else on the face of the globe. This has happened partly because we are, in a healthy sense, an unsatisfied people. We who make automobiles are not satisfied with the fine new model that rolled off the production line today. It may be the best car that has been built up to now. But tomorrow, so help us, we'll build a better one. The chemists who spin a silken thread from a magic brew of air and water turn back to their laboratories bent on new discoveries. The petroleum engineer makes a better gasoline. Now, he says, we'll make it cost less. And he does.

Thinking men are driven by a God-given dissatisfaction with present achievements. Through such men, industries are revolutionized. And even if research workers and their companies were content to rest on their laurels, you and a

hundred million others would not let us. Somehow, because you are Americans, you demand and think you have a right to expect more value, more usefulness from everything you buy, and I think you have.

That's why our tempo of progress is speeding up. American industry is cultivating ideas as its richest investment in the future. We are looking for young Marconis, young Bells, young Edisons. We have many of them in our laboratories now. We encourage them. They are taught to look upon progress as a road that has no end.

If we give them the opportunity of free enterprise, they will contribute freely. In every industry—those existing and those to come—their improvements will demonstrate clearly that what we have today is not enough or good enough. That is why, with all conviction, I say that the future is boundless. It holds a treasure of great and good things for all of us to share and of jobs enough for all of us to do.

Acting Chairman KING. Do you desire to supplement the statement that has just been read?

Mr. KETTERING. If you care to ask any questions, I will be very glad to answer them.

Acting Chairman KING. Do any of the members of the committee desire to ask Mr. Kettering any questions?

Mr. PIKE. On one point, Mr. Kettering. You say that the process of industrial research is American through and through. How does that differ, say, from the German process of research, which for very many decades was regarded as tops in the world?

GROUP V. INDIVIDUAL RESEARCH

Mr. KETTERING. I think the main difference is the fact that you get a group of men to cooperate. I think the particular thing is, our concept of industrial research is not so much an individual working on a problem as a group of men working on a problem. In the German industrial research they usually segregated the individuals on a specific problem, and here we—

Mr. PIKE (interposing). Under competent direction you work the problem out.

Mr. KETTERING. You see, if you can pick a problem, it may be a many-sided problem, and therefore you have to correlate the activities of a group of them. I think that particular thing is original in this country.

Representative WILLIAMS. In that work, do you confine that cooperation to the ones in a particular industry, or do you work in cooperation with research laboratories from other industries?

Mr. KETTERING. The thing I was particularly speaking about was a particular research in any industry in which is required the services of metallurgists, physicists, chemists, and so forth. You see, the average inventor is pretty much of a personalized thing. He likes to work alone. The great difficulty is the transition period from the individual as an inventor to the group as an inventor; that is what I was trying to develop—group invention rather than individual invention.

Representative WILLIAMS. In other words, you have a separate and independent research department—

Mr. KETTERING (interposing). Oh, yes.

Representative WILLIAMS. In your company that works not in cooperation with other companies, but within their own group.

Mr. KETTERING. Yes. We work with other organizations in the problems developed. If it is necessary to work with a chemical company or oil company, we will work with them, understand. But we originate the problems that pertain specifically to our industry.

Representative WILLIAMS. How many men have you in your research division?

Mr. KETTERING. About 400 or 500.

Representative WILLIAMS. And what is your annual expenditure on that branch of the industry?

Mr. KETTERING. I will have to guess. I would say it is in the neighborhood of \$1,500,000 to \$2,000,000. That has nothing to do with the engineering of the General Motors products, you understand. We have nothing whatever to do with the products General Motors makes. We have only to do with broadening the base. You see, we work only on new industries, trying to develop new industries to take up the slack in employment.

Dr. ANDERSON. Will you describe the set-up of industrial research within General Motors and then within the organization of which you are also the head?

RESEARCH IN GENERAL MOTORS

Mr. KETTERING. I will be delighted to do that. Our particular set-up is something like this. There is no very definite way in which you can draw departmental lines of research because they shift almost with every product, but for the sake of generalizing the situation we have our laboratory set-up divided up like this: We have a department of chemistry, and in that department of chemistry we have allocated all of the specific problems that have to do with the chemistry of our industry, which will be paints, varnishes, fuels, and all of the others—metallurgy, and so forth—in that chemical department, and we are departmentalized to the extent of having a fuel-research department, a rubber-research department, plating, and so on; then in the material division, which comes under the general head of chemistry, we have our metallurgical department; then material tests, and so on.

(Senator O'Mahoney resumed the chair.)

Mr. KETTERING. Then we have a department of physics, and in that department we have all the ordinary apparatus that goes with a department of physics. We have our X-ray department, we have our high-voltage department, our ignition departments, and spectroscope and all of the other facilities that would be in a high-grade physical laboratory. And those are all equipped with technicians, and it is the correlation of the technician, say, in the physics department with the technician in the chemical department that I was talking about particularly when you asked the question.

Then we have a department of design, because all of these ideas have to be formulated finally into a concrete thing, and if it were a Diesel engine, we would design a Diesel engine for a service, but not as a product, because you have to design something that you can put in and prove the principle. So we have a design department. In that design department we design apparatus, build it, and subject

it to test, without any idea whatever as to how it is going to be manufactured.

After we have had demonstrated the fundamental principal of that, then some manufacturing division takes that, and we act only as consultants, and have nothing to do with the final application.

Dr. ANDERSON. At that point, how do you determine upon the projects to be investigated by the scientific section of your organization?

Mr. KETTERING. We have a committee of about three or four men, consisting of myself and three or four of my assistants, who try to select the general subject of investigation. Of course, from Mr. Watson-Davis' discussion, you could see there are a million things to investigate, but research men are quite hard to get, and therefore you have to select what you might call the control problems that control an industry, and we are the ones who select those problems, and—

Dr. ANDERSON (interposing). On what basis do you make the selection?

Mr. KETTERING. We make our selection very largely on this basis: looking down the road, what are the most important problems that our industry has? The most important single problem the industry has is the question of fuels, so fuels have been one of our researches ever since the laboratories were started. In fact, long before our laboratories were started, when I was running my own laboratory in Dayton, I had been working on this fuel thing since about 1913, and some of the same boys that started in 1913 are still on the job, and every year we think we know a little something about it and the next year we slip back a little bit, but I think we have gained.

But the reason that is an important problem is because with our best automobile engine that we have today we are utilizing less than 5 percent of the total efficiency of the fuel. That isn't because we don't want to utilize any more. That is the best we have been able to do. That is, there are theoretically about 450 miles, if you could use all the energy in a gallon of gasoline, in a gallon. A small car, Chevrolet, Ford, or Plymouth, would go about 450 miles on a gallon of fuel. I don't think anybody claims we are getting that, but I think we are getting 5 percent of it. As long as there is a 95 percent waste factor in that thing, you can see right away you can't let that go neglected. The fuel and the engine are so tied together that you can't treat one without treating the other, you see. They are integral parts of each other, so engines and fuels have been and will continue to be, as long as the industry lasts, I think, a major problem, and it was out of that work on the study of engines and fuels that we developed this new Diesel engine which we use on these high-speed trains, submarines, and so forth, because we were simply trying to see if the thinking that we were doing was applicable in these other lines, and that has worked out very well.

Dr. ANDERSON. When you make a discovery within fuels, such as ethyl or some other discovery, is that discovery then patented by the company, in the company's name? What is your policy with respect to control of the discovery?

PATENT POLICY OF GENERAL MOTORS¹

Mr. KETTERING. That varies with every one of them. There is no rule. We have no rule on that thing at all. We take out patents, and they are usually turned over to the division that is going to market the thing. They become the property of the commercial organization.

Dr. ANDERSON. So that research beyond the actual discovery and perfecting of an invention does not move over into its application.

Mr. KETTERING. No; you can't do that, and I am glad you mentioned that point because that is one of the places we have to watch. Any new device, it doesn't make any difference what it is, is two things. It is a principle and it is a product. Now, when you put the product on the market first, it is bought by a few people who think they want it. They immediately begin to reflect back on the modifications of that, and it is purely the function of engineering from then on. If you take your research men to do that you don't do another research job for 10 or 12 years, so what you have to do is to set it pretty clearly, and when we set up our research laboratories we set this very clear and distinct line, that we were to have neither authority nor responsibility.

Mr. PIKE. That is where the individual inventor is in a pretty bad fix. He hasn't any separate sales and engineering organization.

Mr. KETTERING. I went through that several times myself.

Mr. PIKE. You did a very good sales job on one of yours.

Mr. KETTERING. That is still going on. The weakest thing—when I say the weakest thing that the technical man per se has, it is that he only knows three dimensions; length, breadth, and thickness. He deals with the material relationships completely, while there is a fourth dimension that we say goes into that, and that is the economics—how much it is going to cost. The thing doesn't become a product until its cost is brought down to the place where people can buy it. You have to get a man cost-conscious, and of course you can't be cost-conscious when you haven't anything to work on.

Dr. ANDERSON. With that divorcement between research of a primary and secondary character and its application, the scientific men are not in any sense responsible for the economic aspects of the product. They are not concerned with whether or not it is put on the market immediately, whether it is held off the market, whether it goes on in partially completed form for trial and error in purchasers' hands, or anything of that sort. They have nothing to do with that.

Mr. KETTERING. No, no. You couldn't have anything to do with it, you see.

Senator KING. My recollection is that we have many examples of brilliant investigators and researchers and inventors who have, at the same time, had considerable business ability, and associated themselves with others in putting their product upon the market to their great advantage.

Mr. KETTERING. Oh, that is all right; yes.

Senator KING. There is no assumption that the inventor lacks skill as a businessman.

Mr. KETTERING. Oh, no.

Senator KING. And as promoter of the product which he has invented.

¹ In this connection see also *Hearings*, Part 2, pp. 328-372.

Mr. KETTERING. No; but merely to facilitate the organization, here is what we have. We have 1,000 people who can make and market a product to one who can originate it. The system that we have set up is a conservation of our originating talent.

Mr. HINRICHS. It does, however, distinctly separate the two functions, so that the inventor, the developer, the research man, has no interest in the question of whether the product is marketed or is pushed into competition with existing processes.

Mr. KETTERING. He has. You have to draw some line where his responsibility stops, see. For instance, we will take our small truck and bus engine. The men who developed that in the research laboratory as a principle elected to go into the factory. There were about 100 or 125 of the boys who had been in that development end who elected to go into the commercial phases of it, so they moved bodily out and went with the thing. They always have that opportunity to do it if they want to do it.

Mr. HINRICHS. It does involve a clear-cut separation of the inventive scientific function and the subsequent decision to commercialize the product.

Mr. KETTERING. Yes.

Mr. HINRICHS. And you now have a situation in which fundamental scientific research on a very large scale is being conducted in enterprises which have an extremely heavy stake in existing processes as well as in the prospective process, whereas in the individualized inventive function the inventor's stake in the past is ordinarily comparatively slight, has been frequently very slight, and his stake in the future may be very large. There is some change in that respect in terms of the commercial application of the product, isn't there?

Mr. KETTERING. I don't quite grasp the point you are making there.

Mr. HINRICHS. The decision now to apply scientific investigation has to be made by a commercial organization with a very heavy investment in the methods of production which have characterized the past, and an investment which might be jeopardized by the prompt application of scientific discovery, and you introduce a commercial consideration into the question of whether it is worth while to apply.

Mr. KETTERING. Well, are you asking whether or not we hold back things because they might interfere with something that is already on the market?

Mr. HINRICHS. I was asking in the first place whether it is correct to assume there is a change in the general situation. My second question was going to be, does that mean that at any point the application of invention is held back, and how is that conflict reconciled by the company between its interest in its existing investment and its interest in the application of a new principle which might result in substantial economies in the future to users of the products, but might also involve jeopardizing, for the time being, a rather large investment that has not yet been fully amortized.

Mr. KETTERING. I can only speak for my own industry. We are always behind. Our people say we are slow. We are not getting

stuff out fast enough. Almost all of our things are new things, and don't interfere with anything that we have already got.

Representative WILLIAMS. May I just interrupt for a moment. There is a call of the House, and I ask to be excused.

Dr. ANDERSON. If a research worker discovered a means of utilizing not 5 percent but, say 50 percent of the full content, and it resulted in a drastic alteration in your automobile, what would be the procedure? You have startling inventions. What happens?

Mr. KETTERING. Of course, I couldn't draw a conclusion from a fictitious thing.

Dr. ANDERSON. Let's take an example that you have had in the recent past, of a great change. Has it in any way been held back?

Mr. KETTERING. Never, never; we have never had that condition in our industry at all.

Senator KING. Even in your large group of investigators, there may be some person who prefers to pursue a very narrow field, and he achieves success in that, and of course coordinates that.

Mr. KETTERING. For instance, here is a particular fellow that may be a specialist along that line. Let him work his specialty in coordination with some other fellow's, of which that is a component part.

The CHAIRMAN. I gather from what you say, Mr. Kettering, that it has been your experience that the researcher and the inventor are constantly endeavoring to produce a commodity, a new invention, a new product, at a cost which will make it commercially profitable to the producer.

Mr. KETTERING. Not necessarily. You can never make them profitable in the beginning.

The CHAIRMAN. But your constant effort is to bring it out so you can put it on the market and dispose of it at a profit; isn't that it?

Mr. KETTERING. Ultimately. Of course, we never have anything to do with it except at the beginning.

The CHAIRMAN. You are head of the research laboratory and you have to do with this long preliminary study which is intended to bring forth the new invention or the new commodity or whatever the discovery or invention may be.

Mr. KETTERING. That is right.

The CHAIRMAN. The problem of marketing is not your problem.

Mr. KETTERING. Not in the least.

The CHAIRMAN. But it is true, I take it, that the research expert is constantly faced with the problem as to whether or not the particular study on which he is working will result in a product which can be marketed successfully.

Mr. KETTERING. That is right.

The CHAIRMAN. For example, my attention has been called over a long period of years to the effort to find new industrial uses for agricultural products. It is a very desirable end to be achieved, because obviously, when we find new industrial uses for agricultural products, we will be successful in benefiting the producer of agricultural products.

Mr. KETTERING. That is right.

The CHAIRMAN. One of these studies has been designed to make alcohol at such a cost that it can be used in automobiles as a fuel,

but to date, it is my information, science has been unable to produce the alcohol at a cost low enough to make it commercially available, isn't that correct?

Mr. KETTERING. Yes.

The CHAIRMAN. That is to be found throughout the line of scientific research, is it not?

Mr. KETTERING. Yes. As I say, the great difference between the fundamental principle and the product is one of economics. That is, you may have a fundamental principle that is all right but it isn't a product yet because it hasn't been whipped into shape from the point of view of its over-all economics.

GOVERNMENT AID TO RESEARCH

The CHAIRMAN. Have you any thought about what may be done, by society, or by Congress, or by the State legislatures, to enable science to pursue its studies more rapidly by making better markets for the products which you are working with?

Mr. KETTERING. Of course, the big problem in that, Senator, is the fact that the process of getting the new industry is almost diametrically opposite from the process of operation. For instance, you take any industry that is a manufacturing operation; they are set up on a schedule of production depending upon the reports from the field, from the sales department, and the current markets of raw materials, and everything. In other words, you have got to budget a modern industry very carefully or the sheriff will get you. You can't go on just making a lot of things ad lib.

The CHAIRMAN. That is true.

Mr. KETTERING. Now, remember that is 99.9 percent of that industry's business. When you come over to the research and development thing, you can't answer any of the questions on the forecast. You don't know when you are going to get the thing done, whether it is going to work or not, and whether it is going to have any value whatever, because it is an intangible thing.

It is the lack of understanding between the operating ends of industry and the development phases—they are almost diametrically opposite in their whole content.

The CHAIRMAN. In what way are they diametrically opposite? We are coming to a very interesting point and I would like to develop it.

Mr. KETTERING. They are diametrically opposite because you can't forecast what a thing is going to be worth before it is developed. I can only work on a very small detailed thing. "When are you going to get that thing done?" I don't know. We have been working on problems—as I say some of the men who started with me in 1913 are still working on this fuel problem.

The CHAIRMAN. The inability of the researcher to predict when he will finish his studies or exactly what he will produce, and the inability of the operator to predict what the result will be, does not in itself indicate there is any opposition between the two.

Mr. KETTERING. No.

The CHAIRMAN. The operator will be most anxious to put on the market the product of the research laboratory as soon as it can be disposed of at a profit.

Mr. KETTERING. There is no opposition. There is just impatience. That is, there is a terrific impatience between operations and researches.

The CHAIRMAN. The operator then is very anxious to have you get through with the job so he will have a new product to dispose of.

Mr. KETTERING. That is right.

The CHAIRMAN. That is what you meant?

Mr. KETTERING. That is right. Now then, it is a lack of understanding. For instance, there is another kind of accounting. You take the detailed cost accounting that is absolutely essential in an industry, it is quite different from the actuarial accounting used in insurance. You have to apply the actuarial type of accounting to research; not what a specific problem is going to cost, but what reasonable percentage of the problem you undertake will come through.

Mr. PIKE. What is your mortality?

Mr. KETTERING. Oh, I would say 99 percent.

Mr. PIKE. Naturally, a lot of these things do end up in thorough and bitter disappointment.

Mr. KETTERING. When I said 99 percent, I wouldn't say 99 percent of the long-range things but 99 percent of the workaday things you are working on today will be a failure. In other words, that is the biggest problem we have in keeping the morale of our personnel up. If you were to walk through a research laboratory with me, the thing that would perhaps discourage you is that almost every one of the projects is in a jam, the thing "busted" up yesterday, you see.

ACCELERATING RATE OF INVENTION

The CHAIRMAN. I have been reading over the prepared statement which you presented at the outset—unfortunately, I wasn't here when you went on the stand—and it suggested several questions which I should like to direct to you. In the first place, beginning toward the end, I note this statement: "Progress encounters new and more difficult problems. Each year the road ahead is steeper."

Do you mean by that that the progress of science and invention is getting more difficult?

Mr. KETTERING. If you read the rest of that, it is explained there as to what I meant. You have to take more things into consideration.

The CHAIRMAN. But as a matter of fact, standing alone, that statement doesn't convey a correct idea.

Mr. KETTERING. No; not if you pull it out, because that was a preliminary statement to another paragraph which came after that.

The CHAIRMAN. The impression I have had has been that the pace of progress is constantly accelerating.

Mr. KETTERING. That is right.

The CHAIRMAN. And because of the accumulated wisdom and invention and development of the past, we can expect larger and larger gains in the future; isn't that correct?

Mr. KETTERING. Well, I don't know, because there are many things that we take for granted. If a young man who comes to work for us can survive two shocks he usually makes a pretty good man. I am talking of the young man who is a graduate of one of our technical institutions. The first shock he gets is that we are working on such

terribly elementary things, because we don't know much. If we don't know a thing, we usually give it a Latin or Greek name.

The CHAIRMAN. I have noticed, during the process of these studies, that lack of knowledge is frequently covered up by a mass of words and statistics.

Mr. KETTERING. And so we say if the boy can survive the fact that we are working on terribly elementary things, that we don't know very much about anything—

The CHAIRMAN (interposing). Of course, elementary things are frequently, I think, the most important, and that leads me to this thought. I think the most elementary of all problems is the problem of jobs.

Mr. KETTERING. That is right.

The CHAIRMAN. And work for people.

Mr. KETTERING. That is right.

The CHAIRMAN. And that leads me to this quotation from your statement:

I like to think of this mass production of ideas—

And I like your phrase "mass production of ideas" because I think that correctly describes our modern condition—

as a team play in an immense effort to readjust our economic system so as to put to work our excesses of men, money, and materials. Our team includes many men, many companies, many industries.

Now, it is implicit in that statement that there is an excess of men, that there is an excess of money, that there is an excess of materials, which is not being used, and that there is something in the economic system which needs readjustment—

Mr. KETTERING (interposing). They haven't got the projects.

The CHAIRMAN (continuing). In order to enable society to put to use these several excesses. Have you any contribution to make on that?

Mr. KETTERING. That is why I say we are behind technologically rather than ahead. We are 'way behind. And I was going to explain why we are behind, because we have taken for granted a great many things. Going back, speaking of the young man, I say he must survive two shocks, one that we are working on such terribly elementary things, and the next that nothing he can find in the books will help him out very much on it. We have used this very simple illustration. You rub your hands together and they get warm, and why is that, and the fellow says, "That is quite simple, that is friction," and yet if you pursue that, you say, "What is friction?" and you end up by saying, "The thing that makes your hands warm when you rub them together." You don't know a single thing about the mechanism of why your hands get warm when you rub them together.

It is hard to get men back to those things and that is the reason I think we are behind. We haven't been willing to go back and take those very tedious jobs.

The CHAIRMAN. Those tedious jobs, I take it, can be pursued successfully only by large, comparatively large, cooperative effort such as that which is illustrated in your research laboratories.

Mr. KETTERING. Well, I don't know. I think that individuals can work on that kind of thing. In fact, there have been some very good individual contributions made, both in this country and abroad, on this mechanism of friction.

The CHAIRMAN. All right, suppose you can get sufficient investigation of these elementary things to satisfy you, what would be the result?

Mr. KETTERING. You immediately begin to broaden out, for instance, you take on some of the things that are available now but not perfected, we will say. We have heard a lot of talk, we will say, about air conditioning. Air conditioning has done a very, very good job, but yet the economics of air conditioning perhaps haven't reached the point at which it can be of general usefulness.

We are trying to find out what we can do to make this thing more flexible, easier to handle, more easily installed, and things like that. In other words, that is an economic problem. We know in our climate up North that one of the factors that is involved, especially in air conditioning in the wintertime, is very low humidity. That requires a new type of window.

The CHAIRMAN. To what extent do economic conditions prevent, if at all, the use and development of inventions and discoveries which have already come into the scientific consciousness?

Mr. KETTERING. I think they have a lot of retardation in the beginning because you don't know quite what the problem is, you see. For instance, I was going to mention on this window business—in trying to hold the humidity up in our section of the country where it gets rather cold in the wintertime, we have to have double windows. There are a number of people that have been working on that, and if we ever get at satisfactory double window, then you immediately would see quite a change in the method of building structures, in houses, and everything else. But we haven't had it yet. We are getting closer to it all the time.

Take television as a new industry. It will have to struggle along quite a long while before it strikes its pace, because you can hit the middle of the road but very rarely, and then it is an accident.

The CHAIRMAN. What is in the back of my mind in asking these questions may probably best be illustrated by reports which have come to us in Congress with respect to housing, for example.

The statement is frequently made that so-called slum-clearance housing in some communities has progressed physically to a very advantageous point. That is to say, very fine apartment houses have been constructed, but it has been found that these new apartment houses are not being occupied by the low-income groups for whom they were originally intended. In some instances it is said the destruction of the slum to make way for the new and improved modern housing project has resulted only, in some instances, in the moving of such families into worse slums, because the group at the bottom of the scale were not economically so situated as to make use of the new product.

Now, isn't it true all through the field that markets are essential to the development of research, and science, and invention?

Mr. KETTERING. The only time we get those research problems which you mention there is when they are reflected back from the

field. For instance, suppose we develop the best thing we know how to do in a research, and it is turned over to the manufacturing division to make and sell, and suppose they try to put that on the market, and after a couple of years they come back and say, "This is pretty good, but it doesn't fit the market. Now, you fellows will have to take another cut at this, make another study of this." Very seldom do they do that, because that organization immediately sets up its own development and research department for that particular product, you see.

The CHAIRMAN. If it were possible to increase the market, either by opening up new fields in other countries, or by increasing the purchasing power of the masses of the people in America, would not that in itself be of tremendous assistance to the scientist in his efforts to develop new products?

Mr. KETTERING. Sure. Of course, the average scientist doesn't get that far in the picture.

The CHAIRMAN. Of course, that is one of the phases of this matter we are studying.

Mr. KETTERING. We can help the scientist best by taking his thought or his idea and developing it into a tangible shape.

The CHAIRMAN. You started your statement with this sentence, which was of great interest to me: "We have been accused of producing unemployment by too many inventions." By whom have you been accused?

Mr. KETTERING. Well, the newspapers and others. It has leaked in through various sources. I don't know where it comes from.

The CHAIRMAN. I often wonder if that isn't a misunderstanding. For example, there was distributed to the members of the committee today a pamphlet, apparently issued by Iron Age, entitled "The Threat to the Machine," and on the second page of this I find a statement attributed to me. It reads as follows—my name, in the first place, and then quoting: "Science and invention are to blame for the present unemployment in America."

Now, I am not conscious of ever having made any such statement.

Mr. KETTERING. I never saw that.

The CHAIRMAN. I know you didn't. I am taking advantage of your presence here, you see, to make a statement with respect to that.

Mr. KETTERING. That is all right.

MASS PRODUCTION AND MASS PURCHASING POWER

The CHAIRMAN. That statement, of course, doesn't begin to represent my attitude toward the machine. Never in my conscious moments have I ever intended to intimate that science and invention are responsible for unemployment.

I think there can be no dispute about the fact that science and invention have immeasurably increased the standard of living in the world, and particularly in America. But while the standard of living has unquestionably been increased, it seems to me it has also become less stable than it used to be. Our grandfathers lived at a very much lower scale; they didn't have electric lights, they didn't have automobiles, they were content to get along with kerosene lamps

or candles; they didn't have any of the luxuries or comforts which we have, but they could support themselves because they were living upon the land.

Mr. KETTERING. That is right.

The CHAIRMAN. Their economy was on a lower plane, but it was stable. Now, our problem is to make certain that the undoubted advance of technology will redound to the benefit on a stable basis of the masses of the people, and that their purchasing power will be so increased that the scientist may make constantly increasing gains. Do you agree with that statement?

Mr. KETTERING. Yes. You have to broaden your industrial base. That is the reason why we have the excesses of men, money, and materials. We simply haven't got the projects. We are behind on the project-getting end of this thing. That is what I am getting at.

The CHAIRMAN. I think there is a good deal of misunderstanding of what is meant and intended by persons who are studying this problem, and I wanted to make clear here in questioning you, that at least speaking for myself, I want to do everything in the world to aid technology and to aid the machine, to make wider and wider use of it.

I recognize the fact that labor-saving devices are desirable and excellent and beneficial in every possible way, but I also recognize the fact—at least it seems to me to be a fact—that the market for all technological advance depends absolutely upon the ability of the masses of the people to use what the scientists are producing.

Mr. KETTERING. That is right.

Hr. HINRICHS. Along that same line, I have one or two questions. Your part, I judge, in this team play that you refer to is to make fundamental scientific advances which may be of either of two sorts. It may result in a totally new product; it may result in a very much better use of an existing product, or a product which is substituted for an inferior product now in use. An increase of fuel efficiency from 5 to 7½, perhaps 10 percent, would result in substantial economy in the use of fuel and probably to an extension of the use of automobiles.

Now you implied in your discussion that the business organization, the operating and sales end, has the job in this team play of making the products of scientific research widely available.

Going back to your first page, you say that there is a necessity for producing new things because we have more hands than we have jobs to do. There is no question that people at present are unemployed, but you would hardly say that in a physical sense the people in the United States were at the present time well supplied with the goods that we know how to make and know how to use, would you? That is, we have, roughly, two-thirds of our population with family incomes of less than \$1,500 a year. As far as I can calculate, it would take an addition of about \$50,000,000,000 to the national income to raise the group that is below \$1,750 to \$1,750. We don't have the technical capacity nor the hands to produce an additional \$50,000,000,000 worth of goods at the present moment.

So that there really are two approaches that are conceivable in team play. One is the stimulation and the easy flow into the econ-

omy of new products. The other part of the team play of your sales organization, your producing organization, is to make existing things available at the lowest conceivable costs in order to get the widest possible distribution within the existing distribution of income. Would you agree with that general statement?

Mr. KETTERING. Yes.

Dr. ANDERSON. Mr. Kettering, getting back for a moment to this divorcement between invention as your industrial researchers conduct it, and the application of invention that is carried on by the business end of your plant. I wonder if you would hazard a statement as to how general that situation is in industry?

Mr. KETTERING. No, I wouldn't. I think that every industry is set up, depending upon its operating conditions. You see, we operate on a decentralized basis. That is, our automobile factories, Cadillac, Buick, Chevrolet, Oldsmobile, and so forth, are all operated as individual units.

That makes it rather easy for us, then, to have a centralized detached laboratory. Now, in an organization in which you have your engineering and your research and your design and everything tied up together, it will work differently. There is hardly any general rule that I can say on how to put that up. We just happen to be fortunate in our set-up to be able to get that sort of thing.

Mr. PIKE. And still there are some things you say you are interested in that are not close enough to the automobile business to put them in your laboratories; for instance, your chlorophyl research, where you go out to Antioch.

Mr. KETTERING. That is a personal thing. The reason for that is that you couldn't ask any industry to take that on. I have been interested in that one for a great many years, and we are interested in that. You know, the word "chlorophyl" is just the Greek word for "green leaf," and we don't know any more about it in Greek than we do in English.

PHOTO-SYNTHETIC ENERGY

The only reason we are here is because of the ability of a plant to trap the sun's energy. I felt that was important enough to set a group of scientific fellows to see if we could find out how it is done. Out of that has come a lot of very, very interesting things already, although that is absolutely set up as a purely scientific research. It has nothing whatever to do with business or anything else, and we have been on it about 10 years now and we have been able to clarify a lot of things. Some practical things have come out of it. For instance, this question of why certain pastures are poisonous to white stock but not to black stock.

There are certain pastures in which only black sheep can be pastured, or black cattle. The reason for it is that there is some weed or something that the cattle eat that sensitizes them to light. Now, if they are white, that lets some of the undestroyed radiations go into the blood stream and they get quite sick. Well, some practical things like that have come out of this already.

We know a ton of hay dried in the dark is worth about four tons dried in the light.

The CHAIRMAN. That is pretty far afield from the motor industry, isn't it?

Mr. KETTERING. This is my scientific golf game.

Dr. ANDERSON. Mr. Kettering, why is it with such a practical prospect as you have indicated, that industry does not undertake such basic research as your study of chlorophyll?

Mr. KETTERING. I think the reason for it is that there is no way in the beginning of drawing a line between the question of whether it is fundamental or whether it is some fellow's hobby, because if you try to follow all those hobbies you would just go out of business in a hurry.

Dr. ANDERSON. That leads to the next question: How does your corporation determine on the fund, the size of the fund, the amount to be placed at your disposal for research?

Mr. KETTERING. They leave that entirely to us. We ask for an appropriation to cover what we believe is an honest interpretation of what we are able to do.

Dr. ANDERSON. Is that fairly general in industrial research?

Mr. KETTERING. I couldn't answer that.

The CHAIRMAN. In presenting your request for an appropriation you have to make some justification of it, I assume.

Mr. KETTERING. Not very much, Senator. We are pretty well known in our organization.

The CHAIRMAN. Of course, you are pretty well known outside of your organization, too.

Mr. KETTERING. I mean by that, we have been working along certain definite lines. We set up our projects just about as I outlined. For our physics department we would like to have so much money for that, and here are the problems that are in there, and here is the probable new thing we would like to put in if things work out during the year. Then we put a cushion in there of X number of thousands of dollars that this thing can be automatically pulled out or shoved in.

The CHAIRMAN. The output of your laboratory over the years has paid for itself, has it not?

Mr. KETTERING. They still give us money.

The CHAIRMAN. They wouldn't do it if you weren't paying; isn't that right?

Mr. KETTERING. They never tell us. The only way we know whether we are going along right is when we see the corporation building a building to make new things they never made before.

The CHAIRMAN. Industrial research, I suppose, is keyed to its utilitarian phases.

Mr. KETTERING. Not nearly so much as you would think.

The CHAIRMAN. Then to what extent are you permitted to go outside of utilitarian objectives?

Mr. KETTERING. I am going to assume that you mean by utilitarian that thing which is obviously applicable to our industry.

The CHAIRMAN. Oh, no. I think that in your case, or in the case of any similar or comparable research laboratory, the corporation would be very glad to accept your judgment that the eventual result of a particular line of inquiry is likely to produce something of value to the corporation.

Mr. KETTERING. I can tell you how that is evaluated.

GENERAL MOTORS RESEARCH BUDGET

The CHAIRMAN. That is what I would like to know.

Mr. KETTERING. In dividing our appropriation, we say that it has worked out about this way: about 40 percent of our appropriation goes to consulting services to our divisions. We are a free consulting engineering operation to all of our divisions, and they come there and talk to us about this, that, and the other thing.

The CHAIRMAN. In other words, they bring to you their immediate problems.

Mr. KETTERING. They don't bring the problems there so much as they come and ask us to come out to their place and help them work on a thing there.

The CHAIRMAN. But it is an immediate problem that they want worked out.

Mr. KETTERING. That is fine, for two or three reasons, because that keeps us very definitely in touch with our industry. Then there is about 30 percent of our budget that is applied to more or less advanced engineering and where we have to design the apparatus to demonstrate the principle; and then there is 30 percent that is very long-range material.

The CHAIRMAN. It is conceivable that the 40 percent represented by your assistance to the various divisions, and the 30 percent which is represented by the development of problems which you yourself see for the improvement of the industry will produce sufficient results to carry the other 30 percent without profit.

Mr. KETTERING. Because you see the 30 percent, we will say, of design and engineering, 4 or 5 years ago was the top 30 percent. It is working this back down into that thing, because it is surprising how long it takes, sometimes, to get a thing clarified enough in your mind to put it down on a drawing board and make a piece to represent it.

For instance, you take the simple thing of a spectroscope, which is this method of splitting light out as an analysis factor in a foundry. Well, we have been playing on that for a great many years, but it is only recently that we have been able to get a spectroscope which is a highly scientific piece of apparatus, that you could put out in a foundry. Yet, if you had come to the practical board 20 years ago, they would have said, "We don't see how you can do that." But all the fellows all along the line have been making improvements—the optical men, the glass men, and so on—and finally you have an object of scientific accuracy in a light-proof case and you can put it in your foundry and a fellow can make his analysis and control his steel very much better than he did before. So that intangible 30 percent is going to come of age some of these days, so you have to have that put in.

It is just like a calendar. You have a calendar here of 365 days and you keep tearing one off each day, and it gets thinner. That is the way it is with products. Every time you take one off you have to put a new intangible one on the bottom, otherwise you run out.

Dr. ANDERSON. Mr. Kettering, how much money did you budget last year for research in General Motors?

Mr. KETTERING. I think it was between \$1,500,000 and \$2,000,000.

Dr. ANDERSON. What percentage would that be of total General Motors expenditures for the year?

Mr. KETTERING. I haven't the slightest idea. Do you mean from an engineering standpoint?

Dr. ANDERSON. Yes.

Mr. KETTERING. I couldn't tell that. I think we could get those figures for you. You take an organization like the Buick; they have their engineering expense divided into two classes. They have what they call research, a group which has to do particularly with their product, but this would only be a very, very rough guess; I imagine the total engineering and research budgets for the divisions would be around ten or twelve million dollars, so that I should say our specific research thing was maybe about 10 percent. Those figures are purely guesses, and we can get them for you if you would like them.

Dr. ANDERSON. You made a point a moment ago that you didn't know precisely what is going on in other plants with respect to research, but I would like to question how independent of each other large business units, supposedly competitive units in the same business field, are in the research field.

Mr. KETTERING. Well, they are independent in one way and in another way they are not. They bring all of this stuff together through their engineering societies. For instance, we have a very fine society known as the Society of Automotive Engineers, the S. A. E. We have a research committee in that, and through the papers and so on I think everybody knows what the general problems of the industry are. As to what is being specifically attacked by each organization, I don't think we attempt to find out. Chrysler is working on problems that we are on. We don't make any attempt to find out. I am perfectly sure if we asked they would tell us, but we don't abuse the courtesy.

Dr. ANDERSON. How near standardized has the product become as a result of this general knowledge of research in the full field?

Mr. KETTERING. Not very much standardized, because there are always many approaches to the thing. You take in our own corporation we have two schools of engineering so far as engines are concerned, the so-called L-head and the valve-in-head engine, and you can't standardize those two. Each of those groups sticks to its own view-point.

Dr. ANDERSON. Why is that?

Mr. KETTERING. Because a man's experience and his work have been along one line, and the two things aren't alike. There are a lot of things different in them. When the valve-in-head fellow tries to step across he tries to carry the valve-in-head practice and vice versa.

Dr. ANDERSON. In other words, you would say that there is little hope from the research side to come to the standardization in which there would be a common product.

Mr. KETTERING. I think that would be very dangerous. You might agree on a standard today, and say that this thing is the only thing we ought to make, and tomorrow, if you went ahead, you would find out something else. We have seen that happen in materials like steel, in which they wanted to standardize a kind of steel, and a few months afterward we found out that if they had, they would have taken the wrong one. No; I think you want to keep the front of

industry fairly broad, and specific standardization can be very dangerous.

INTERORGANIZATIONAL COOPERATION

Dr. ANDERSON. Undoubtedly basic research is carried on both in industrial research laboratories and in universities and Government laboratories.

Mr. KETTERING. Yes.

Dr. ANDERSON. Do you have any estimate of the dependence of industrial research laboratories upon the universities and Government research?

Mr. KETTERING. They work together in a great many cases; in other cases they can't. But there are good working arrangements—you take between the Bureau of Standards and industry, and between the university laboratories and industry—but there are certain of those problems. For instance, let's take a very specific case. Take the injector that we use in our Diesel engines. That was a very difficult problem, because it parted from what you call conventionalism. We arrived at a conclusion from other work we had done that we had to raise the injection pressure from, say, 4,000 pounds to 25,000 pounds. When you begin to try to pump oil at 25,000 pounds it introduces quite a problem. The argument was that if you made this thing accurate enough so that you had to fit a piston into a little barrel so accurately that oil at 25,000 pounds wouldn't leak by, logic said if that is the case, you only need to move that a couple of times until that accuracy will be worn away.

It didn't work out that way at all. It doesn't wear at all. We have injectors back from locomotives that have been run a million miles, and they are still absolutely accurate. But if you make a little more clearance it wears very rapidly.

There was a thing on which it took us years to get over the hurdle. The limits that we use, the tightness of the fits, can best be illustrated by saying that if you take a human hair, that is three-thousandths of an inch in diameter, and you cut that up into 120 equal pieces, the size of one of those pieces is the limit we have.

To make that commercial was regarded as an impractical thing, and they said, "It is impractical because if you make it that close it will wear." If you make it that close it doesn't wear. Why, we don't know. We have all the time to be investigating such terribly elementary things.

Out of that, of course, came quite a step in the so-called Diesel engine development.

Now, answering your point, the university laboratory can do certain types of work that have to do with fundamental principles. You take one piece of research work that is being done in a university that is tremendously important is by Dr. Lawrence out on the cyclotron. That certainly could be done only in a university, and that depends on Dr. Lawrence. Then Dr. Urey's work on heavy nitrogen. Many of these universities are doing splendid work. What you have to do is gather them up and write them up, and see how much of it you can use in today's product.

Dr. ANDERSON. There is no thought in your own mind that industrial research is actually supplanting basic—

Mr. KETTERING (interposing). Oh, no, no. We are still shy. We need much more of it all the way through.

Dr. ANDERSON. Do you think there is any danger of basic research to lag for lack of funds due to the fact that industrialists are applying more and more of their funds to their own research?

Mr. KETTERING. No; I haven't seen that to be the case at all. I have two or three of these researches which I couldn't and wouldn't ask industry to do. Chlorophyl is one, some of the medical work we are doing at Dayton, and one or two other things, and you just couldn't ask industry to do that to start with. That is the reason why I have underwritten those, to get them started. After a while they may go on their own.

Dr. ANDERSON. Is there a lack of capable people for research work?

Mr. KETTERING. No; there is not a lack of specific technicians. You can get somebody to do anything you want done. The lack that we have is the keeping of those people on a definite track. In other words, the one great temptation you have when you are working on a research problem is, you are uncovering something new. That something new may be just a way station on this thing you are working on. The great temptation is to run off sideways. It is a grapevine; you want to run off there, but to keep the fellows on through to destination first is your problem. Then you can always come back and do this afterwards—the problem is to keep men's minds definitely on a problem until you get that solved, and that furnishes your survey line from which you can do all your other work.

Dr. ANDERSON. What are the incentives that inventors in your industrial plant have, the monetary incentives? Do they gain by the invention made?

Mr. KETTERING. They gain in this way. We don't give specific bonuses to the inventor. We give the bonus to the laboratory, and the reason we do that is because we want to keep these fellows from becoming individuals. If we gave the bonus for a new invention to the specific man under whose care it was done, then these fellows would just begin to make little cliques, but if the laboratory gets the thing—

The CHAIRMAN (interposing). That is your team play.

Mr. KETTERING. That is the team play, and it works out very well because everybody is assured something every year.

Dr. ANDERSON. What would a bonus look like, say, for last year?

Mr. KETTERING. I can't tell you.

Dr. ANDERSON. It doesn't apply to a particular project that has been consummated.

Mr. KETTERING. No; what they do, they give the laboratory a bonus depending upon what they think we have done.

The CHAIRMAN. I like that phrase of yours, Mr. Kettering, about team play. It suggests to my mind the desirability of putting a lot more people who are at the bottom of the social scale on the team so that they will benefit equally, or at least to some extent, from the wonderful progress of technology. I think it will work both ways.

Mr. KETTERING. Most of us came from there anyhow.

EFFECT OF PATENTS ON INVENTION ¹

Mr. O'CONNELL. Mr. Kettering, I would like to ask you a question or two relative to the patent system which has, as I understand it, the general purpose of promoting progress in science and the useful arts. I wondered if you had any view as to the importance of existing patent laws as regards the type of invention you have been describing, so-called group activities.

Mr. KETTERING. I think if there is any modification in the patent laws, it ought to be made by the patent department and, say, the patent solicitors, and that sort of thing.

Mr. O'CONNELL. I understand they would do it. I thought you might have some views on that.

Mr. KETTERING. We are celebrating tomorrow the one hundred and fiftieth anniversary of the first patent law that Washington signed 150 years ago. You never get anything perfect, but I think our patent laws are pretty good.

Mr. O'CONNELL. It is a fact, if I understood the testimony, that the type of invention that you have been describing is more or less on the increase, the cooperative activity by large organizations.

Mr. KETTERING. I think it would have to be. For instance, on a complicated thing like that injector, we had to have the expert metallurgist, expert physicist, and all that. There wasn't any one of those fellows that could have done that job.

Mr. O'CONNELL. Wouldn't it be the fact that organizations such as yours would function and continue to operate even if there were no such thing as a patent system?

Mr. KETTERING. So far as patents concern an organization like ours, I think they are only important from one standpoint, and that is of preventing other people from coming in and saying they did the thing, so you have to patent a lot of things as a protective thing. I think patents still have an enormous value from the standpoint of the inspirational effect they have on people, and certainly for the small concern they are vital, very vital.

Mr. O'CONNELL. Addressing ourselves solely to the type of organization you have been describing, it occurred to me that even in the absence of any patent laws at all, the mere force of competition in the industry would probably require the type of organization you have been describing.

Mr. KETTERING. I imagine so, yes; but I am a terribly optimistic person on what can be done if we get coordinated right, if we get the thing understood as to what our problems are. Only 10 years ago we didn't have enough people to supply the job and I think we can do this job. I say, if we have brains enough to get out of the cave, I think we can keep from going back in.

The CHAIRMAN. That is a very hopeful statement.

Mr. O'CONNELL. I don't want to press the point, Doctor, but apparently organizations such as yours would undoubtedly continue to function and would be forced by competition to function even were there no patent laws.

Mr. KETTERING. We don't run our organization for the purpose of taking out patents. We think only of the general problems. And

¹ For general discussion of this subject see Hearings, Part 2.

I would like to say, if any of you are out in Detroit any time, we would be glad to have you spend a day or an hour, whatever time you have, to take a look around and see how it is done.

The CHAIRMAN. I shall take advantage of that.

Mr. KETTERING. It is quite different when you see it from how you talk about it, when you see what foolish little things we have to work on to get a link cleaned up.

The CHAIRMAN. Doctor, have you given any thought to this problem of coordination which you have just mentioned?

Mr. KETTERING. We have thought about it a lot.

The CHAIRMAN. Do you want to testify about it?

Mr. KETTERING. No, no. It hasn't crystallized in any specific thing.

The CHAIRMAN. Don't you think we ought to try to crystallize it?

Mr. KETTERING. Well, I am doing that. I think within our own industry we have it pretty well worked out.

The CHAIRMAN. That is true. There can be no question about that. The record of General Motors demonstrates that.

Mr. KETTERING. But we are working very closely with educational institutions and everything else, and we are trying out a few experiments this, that, and the other way, and I think some of these days we will have something that we can give you, at least a program, at least something to prove wrong, and I haven't it crystallized enough to lay that on the table for you today.

Mr. PIKE. Of course the production department is here again a little bit impatient for results.

Mr. KETTERING. I think that is a good stimulating thing. I have no objection to the impatience of the production department.

Mr. PIKE. There is one thought I had in mind. As a small part of this coordination you spoke of interindustry cooperation—and it occurred to me the development and commercializing of ethyl fluid, perhaps, was a fairly good example of cooperation between yourselves, du Pont, Standard of Jersey, and Dow Chemical—there must have been research by all of those organizations in one way or another to make that thing go.

Mr. KETTERING. Well, for instance, you take the one particular thing in that; when we started to make that material the total production of bromine in the world was only 600,000 pounds, and we couldn't think of starting anything unless we had at least 2,000,000 pounds a year. I had to go and bargain my shirt almost to get the Dow Chemical Co. to drill the necessary salt wells to produce the bromine. We knew we couldn't continue that, but there is 1 pound of bromine for every 10 tons of sea water; that is 1 part to every 20,000. We have a plant at Wilmington, N. C., taking 43,000,000 pounds of bromine out of the sea this year. That couldn't have been done by any individual. We just had to have it, because that was the only supply of bromine that was available in that quantity, and you see that is a very small percentage, 1 part in 10 tons.

Mr. HINRICHS. Mr. Chairman, I would like to come back to your question for just a moment on the bonus at the bottom of the heap. That sometimes shows up in the form of larger wage incomes, but I am thinking of the situation in which the bonus on invention is often the specific displacement of a particular group of workers, or of a particular individual as the process changes. Your phrase is that through these men, without giving dissatisfaction, industries are rev-

olutionized. A revolution of any sort may be a very necessary thing, but it is inevitably a very disturbing thing in the area in which it occurs.

In the Bureau of Labor Statistics, Congress set up what it called an occupational outlook service, and I am interested in the problem of the point at which it is possible to visualize the changes which are coming so that they lend themselves to planning by business executives, by trade-unions, by those who are concerned with the operation of an industry in an effort not to stop progress but to minimize the dislocations which are inherent in this revolutionary process.

Now, is it possible at the stage when one of these machines leaves your laboratory as demonstrating the practicability of the principle or the fact that a principle will work—is it possible at that stage to forecast even approximately; not in detail, but what in general the area of the impact of that upon the technological structure will be?

Mr. KETTERING. No. Take the Diesel engine. We made the Diesel engine without any regard to where it would go. It went in the railroad industry first, and yet nobody would have anticipated that, and nobody even predicted it. As Mr. Harriman said, they tried it out purely as a means to see if they couldn't do something to have people look at a railroad train again, and the fact it was a success was as much a surprise to them as to anybody else.

The CHAIRMAN. Sort of a matter of general research in the beginning?

Mr. KETTERING. Yes.

Mr. HINRICHs. At what stage did it become possible to see where this was going, what its impact was going to be?

Mr. KETTERING. It isn't even evident yet what it is, and 5 years ago—to show you how you can't tell—we didn't have a plant to make the Diesel engine, and we bought a piece of ground outside of Chicago, out at La Grange, Ill. We built a little plant there for three hundred people and broke ground just 5 years ago now. We have between 3,000 and 4,000 people working directly in that plant, and perhaps 5 times as many working indirectly in it, and nobody could predict from year to year what was going to happen, and we can't do it today. We haven't the slightest idea what that business is going to be.

Mr. HINRICHs. Do any of your principles and does any of your work affect the production practices of your own establishment?

Mr. KETTERING. We have nothing whatever to do with any production problems.

Mr. HINRICHs. That work is all in the engineering, designing, and research division of the operating companies?

Mr. KETTERING. That is right.

Mr. HINRICHs. And it is at that level you would have to work if you were trying to anticipate change in the going occupational structure?

Mr. KETTERING. Yes.

COST OF INDUSTRIAL RESEARCH

Dr. ANDERSON. Getting back for a moment, Mr. Kettering, to this cost of research, you indicated in your own division you spend approximately \$1,500,000, and the total General Motors expenditure

would be approximately ten to twelve millions of dollars. If it could be assumed that other large units in this business would spend correspondingly, it would appear, would it not, that it cost a great deal to carry on the day-by-day research necessary to produce an automobile?

Mr. KETTERING. Yes.

Dr. ANDERSON. Would you hazard a guess as to what effect that would have on the smaller units within the business? Is it true that that is an advantage so large that it would be a hindrance of smaller business?

Mr. KETTERING. No; they can buy those units—they can buy practically all that stuff on the open market.

Dr. ANDERSON. They can buy what you produce in your research laboratory?

Mr. KETTERING. Yes; as soon as it gets into production. There is a great advantage in having a large company put it on the market first. For instance, this hydromatic transmission we are putting on the Olds this year is quite an expensive thing and is being worked out. We have got up to a production of a couple of hundred a day now, but the independent transmission manufacturers have an article for sale almost exactly like that.

Dr. ANDERSON. In other words, you would say it works just in the contrary way?

Mr. KETTERING. I would say it doesn't work either one way or the other. In other words, the automotive industry has never been very tight on patents. I mean, we have never tried to hold exclusiveness at all.

Dr. ANDERSON. Who takes out the patents, your division or the corporation from the operating side?

Mr. KETTERING. We take out the patent in the name of some individual, whoever originated the project.

Dr. ANDERSON. Your division takes it out?

Mr. KETTERING. Or the company, the General Motors Corporation under the name of the particular fellow.

Dr. ANDERSON. And what about intercompany use of patent rights?

Mr. KETTERING. That is always done.

Dr. ANDERSON. One more question. From 1920 to '30, the economists quite generally in the literature regard the automobile as having been largely responsible for a generally high level of employment and general prosperity, and you have indicated that there is a lack of projects, of new areas of performance which need to be explored and made practical. Do you anticipate in the decade 1940-50 anything comparable to the automobile?

Mr. KETTERING. No; I haven't, but we started one in this railroad business, the Diesel engine business. That has grown pretty healthily and we are feeding in new things all the time. The length of time that it takes an industry to become an important factor is around 10 or 15 years, and you never can tell when you start them out how far they are going to go.

But you take the aviation industry. That is only 36 years old. It started when they made the first flight. Its development has come in the last few years because we have learned how to make engines, and things like that.

So I think all you have to do, if we can get everybody to understand that he ought to go ahead, that the thing should be done—but a lot of people are pretty gloomy today.

The CHAIRMAN. The common assertion is that we may not look confidently for a boom through the development of aviation as we did through the development of the automobile, because the automobile was obviously much more suited to universal use than the airplane.

Mr. KETTERING. I think that is true. But you take things like radio. There were great contributing influences on employment.

The CHAIRMAN. Because the radio can be used by the masses of the people.

Mr. KETTERING. The interesting thing about radio is that the development of the parts that go into radio has made possible doing a lot of other things that never could have been done abstractly. So the interrelation of these things can't be anticipated at all.

The CHAIRMAN. It has been said that the building of the railroads contributed to the era of prosperity after the Civil War because that construction made a demand for almost unlimited quantities of material, for labor, and for capital; and then the development of the automobile industry and the development of the radio industry likewise had a very beneficial effect upon general prosperity.

As a research expert, do you see anything to take the place of railroad development, motor development, radio development, in anything?

Mr. KETTERING. Yes; I do.

The CHAIRMAN. What do you see?

Mr. KETTERING. I think in these new types of locomotives that you could perhaps re-do to a large extent the method of railroad transportation.

The CHAIRMAN. That would be rehabilitation of the existing roads?

Mr. KETTERING. And when you go around, you can go around the second time. You take housing—certainly many of the new factors being developed in other industries when applied to housing, are tremendous. In fact, I think that is one of the big things. When I speak of air conditioning, I mean the control of humidity and temperature the year around, not just the summer time. That is little understood, and that is going to have a tremendous effect which we haven't broken open yet, you see.

The CHAIRMAN. Are there other questions, Dr. Anderson?

Dr. ANDERSON. No.

The CHAIRMAN. Any other members of the committee?

LOW-PRICED AUTOMOBILES

Mr. HINRICHs. I have just one. This is a chart which was introduced yesterday referring to income levels in American life.¹ You are talking about new industries. I would like to call your attention to the fact that the automobile industry itself has on several occasions become a new industry by digging deeper into the going structure. That is, prior to 1914, you were selling automobiles generally in the \$5,000 income class and above. That is that very thin, long, white line with about 800,000 families in it. Then during the war

¹ See "Exhibit No. 933," supra, p. 5440.

you dug down in the next level of 1,500,000 families, in the \$3,000 bracket. At the present time the automobile industry has, of course, done a magnificent job in supplying transportation to the American people, but a relatively small percentage of the population in the income levels where these families are concentrated still has automobiles.

Take the group, for example, from \$2,500 down to \$500; in that group some 50 percent of the families have automobiles—a much higher proportion at the higher income levels, something like 10 percent in very old cars at the lower income levels.

Now, there is an opportunity for the development of a new industry, if there is any way to furnish a larger proportion of these people at the lower-income levels with cars, either by raising their incomes, which puts them into a different class, or by lowering prices and costs in such a way that that group can be served in precisely the same way that the automobile industry has heretofore reached down and bored deeper into this population that becomes denser, the further down you go.

Now, is there any prospect, in terms of the research work, as you see it, in the automobile industry, of digging more deeply than we now have?

Mr. KETTERING. That wouldn't be a thing that would contact us. That looks to me more a matter of engineering, economics, manufacturing facilities, and so forth.

Mr. HINRICHs. That is, you pass the ball to other members of the team, quite properly?

Mr. KETTERING. It doesn't belong to us anyhow, you see. That is, if we should accidentally discover a new way of developing power, something like that, that would make the automobile cheaper, then that would immediately pass over to us, but as the thing stands today we haven't anything—that is, we have gone around this circle many, many times; in other words, the automobile consists of an engine, transmission, axle, and so forth. Every one of those we have been around dozens and dozens of times to see if it is possible to break what we might call the conventional points of view in it, and, of course, we go far afield in that, but none of them have been fruitful of anything, because you remember there have been 60 or 65 million motorcars made, and there has been an awful lot of engineering done on that particular thing. That is, your chance of changing specifically to any great amount the present type of motorcar isn't very great, only by such radical changes as fuels, metallurgy, and things like that, and, of course, they are being followed right up to the last minute.

Of course, there are 2½ used cars sold in the market for every new car that is put out, so you have quite a large production of reasonably low-priced cars.

Mr. HINRICHs. The chances, then, of a very much greater extension of automobile production for complete servicing of the people with cars, so far as scientific possibilities are concerned, seems to depend upon the distribution of income rather than on the cost of the car?

Mr. KETTERING. That is as our knowledge stands today. I wouldn't say our knowledge we get tomorrow or day after tomorrow wouldn't help, but we know what our limiting factors are today, and we

haven't been able to push any of them over. We are working at them all the time.

Dr. ANDERSON. Automobile trade publications make much of the fact that after the period of sharp reduction in delivered price of automobiles that came, say in the early '30's, when it began to flatten out, we had a period in which you engineers built more quality into the car.

Now, will this quality improvement ever suffice to do what Mr. Hinrichs has suggested? Will it not continue to keep that big buying group in the lower part of the pyramid using old cars?

Mr. KETTERING. I don't know. Of course, the adding of radios and heaters, and that kind of stuff, which is apparently what the public demands, we don't try to follow at all over in our place.

Mr. PIKE. Of course, if you ever got anywhere with your fuel problem, you would have some sort of an answer to this. I think it is a fair statement to say it costs as much to run a \$50 car, of which there are a great many—

Mr. KETTERING (interposing). I agree with you.

Mr. PIKE. As it does to run a new \$600 or \$700 Chevrolet or Ford or Plymouth, and I believe it would be a fair guess that it is the cost of operation rather than the first cost that keeps a great many families in the lower bracket from owning cars.

Mr. KETTERING. I told you fuels and motors are the two No. 1 problems, and have been ever since the research laboratories were organized.

Mr. PIKE. You get us 200 miles on a gallon and there will be a whole lot more people able to own and operate a car.

Mr. KETTERING. I can't promise that today.

The CHAIRMAN. Are there any other questions?

Dr. Kettering, we are again very much indebted to you for an interesting and stimulating discussion.

(The witness, Mr. Kettering, was excused.)

The CHAIRMAN. Is there to be a session this afternoon?

Dr. ANDERSON. Mr. Chairman, unfortunately, William Green, who was to have been here this afternoon, was unable to be here so there will be no session so far as we are concerned.

Tomorrow morning we will have Mr. Edsel Ford, and in the afternoon, Mr. Thomas, U. A. W. A. They both definitely said they will be here, and unless we get a later announcement we know they will be.

The CHAIRMAN. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon, at 12:30 p. m., a recess was taken until Wednesday, April 10, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

WEDNESDAY, APRIL 10, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Tuesday, April 9, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, of Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representatives Summers (vice chairman), Reece and Williams; Messrs. Davis, O'Connell, Hinrichs, Pike, Kreps, and Brackett.

Present also: Frank H. Elmore, Jr., Department of Justice; Commissioner Charles H. Marsh, Federal Trade Commission; George E. Bigge, Social Security Board; and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman and members of the committee, on this third day of hearings we are fortunate in having Mr. Edsel Ford, president of the Ford Motor Co., Mr. R. H. McCarroll, who is seated in the middle of the trio, engineer of the chemical and metallurgical divisions of the Ford Motor Co., and Mr. H. L. Moekle, auditor for the Ford Motor Co. These three gentlemen have kindly consented to come and share with us their knowledge of the technological processes in the Ford Motor Corporation. Mr. Ford has submitted a statement to the committee which Mr. McCarroll, I think, will read. It was in answer to questions directed to him concerning technology and his answers are contained in the statement which he is prepared to enlarge upon at the committee's pleasure.

Beyond that, however, he is also here to tell that very important story of the change-over from one model of Ford production to another, which involved the building of the Rouge plant, so that we have two aspects of the Ford Motor Co.'s testimony, one their response to questions directed to them on the problem of technology, and then following that Mr. Ford's contribution concerning the re-tooling story and its implications.

Mr. McCarroll will proceed with the statement of the Ford Motor Co. with respect to these particular questions.

STATEMENTS OF EDSSEL FORD, PRESIDENT; R. H. MCCARROLL, ENGINEER, CHEMICAL AND METALLURGICAL DIVISIONS; AND H. L. MOEKLE, AUDITOR, FORD MOTOR CO., DETROIT, MICH.

Mr. MCCARROLL. The information set forth hereunder is compiled for the use of the Temporary National Economic Committee of the

Congress of the United States, created pursuant to Public Resolution 113 of the Seventy-fifth Congress, and is intended to be submitted in this form and to be made a part of its records of the hearings during the period of April 8 through April 19, 1940, on the subject of Technology and Its Relationships to Economic Recovery. The information is compiled in accordance with an outline suggestive of the scope and character of the hearings attached to letter dated January 24, 1940, from the Temporary National Economic Committee addressed to Mr. Edsel B. Ford and signed by Mr. H. Dewey Anderson. Examples are given from plant operations in some cases better to illustrate the statements made.

The Ford Motor Co. has pioneered in the continual development of labor-serving and labor-saving machinery. With such machinery and technological improvements it not only has been able to lower costs and make more desirable products but it has helped to increase employment.

Question 1, on the effect of investment :

What is the effect of technological change on the use of new capital?

Answer. In the operations of the Ford Motor Co. technological change in the way of improvements calls for the continual investment of new capital. A recent and good illustration of this is the development and use of a new type of cylinder liner which is now being introduced and made a part of the product. At present (March 1, 1940) this is taking 12 men off the former type cylinder work, but is adding 386 men to the work in the manufacture and installation of the new part. In 60 days the added employment from this new development, which improves motor operation, lessens the amount of oil used, and decreases maintenance cost to the owner, will be about 500 men. The capital expenditure to equip the factory for this job so far has been about \$880,000. The total expenditure by the Ford Motor Co., for new and improved machinery, together with the necessary buildings, during the year 1939 was about \$36,000,000.

Question 2. To what extent has technological change become related to the size of an industry and its control of substantial capital? Is it true that the complexity and cost of modern techniques place them beyond the use of small independent business, thus giving an advantage to multiple-unit industries and monopolies?

Answer. It is true that some technological changes in the line of improvements and new developments require much time and money and therefore, it is believed, can be done more readily by large industries. Many improvements probably would not be put to use except for the facilities of large industries, especially where their effectiveness depends upon large production. It is necessary at times to spend hundreds of dollars a day over a period of years before a new method or article can be put in production. The improved Ford crankshaft and method of making it is a good example of development of this type.

It is not believed technological advances are beyond the use of small independent businesses, as this company always has taken advantage of such advances. Many ideas for new developments can be worked out by individuals or small businesses. As an illustration, mention may be made of new mechanical devices or new plastic materials and parts. Work of the kind that the Ford Motor Co.

is doing on the industrial use of farm products would be in this class. Reference is directed to page 4, chapter 5, Background 1940 Census by Department of Commerce, Bureau of the Census, on "Cash Crops For Use In Industry," where it is stated:

The 1940 Census will carry an important message to the farmer in the measure of the increased industrial use of his products. An example: Soybeans were first imported in 1804 but it was not until 1910 that there were enough of them to show in the census report. Since then the acreage has jumped to more than 6,000,000 acres, mostly as a result of expanded commercial use. They are utilized for everything from oil and paint to automobile accessories; to bread for humans, and food for livestock.

Question 3. What are the effects of patent rights on technological development?

Answer. Patent rights can be used or misused. When used as they are by this company, they help to advance development. Every attempt is made to develop their widest use at the lowest possible cost.

When patent rights are held by those who make no effort to put them to good use, they may retard development. However, when considering modification of patent rights, there must not be overlooked the incentive given to thought and work and development by the possible compensating returns from proper use of patent rights.

Question 4. What would happen if technology were freely developed? What retards use of available technological devices? Are we slower or faster than we should be?

Answer. It is assumed that "freely developed" in this case means "without patent rights." If this is so it is believed this question is answered by the reply to question No. 3.

It is believed the use of some devices is retarded by the fear of capital to make the necessary investment under the present limiting conditions, whereby it shares in all the losses but in little of the profit. The chances against success are too great. Too, the theory of scarcity (to which this company does not subscribe) rather than that of plenty is another retarding factor.

Usually, full use is slower than desired. Some advances come as a series of intermittent or gradual and continual steps to the final total improvement desired. It is estimated that the time in general between the conception of an idea and its use in practice is from 1 to 5 years.

Effect on labor:

Question 1. What is the effect of technological change on the volume of production, the number of workers employed in that production, and the volume of wages paid?

Answer. It is believed that the effect of technological change (improvement) has been and will be to increase the volume of production, to increase the number of workmen, and to increase the volume of wages paid.

The amount of pay roll and purchases per Ford, Model T, with its about 5,000 parts, in 1926 was \$454.42.

The amount of pay roll and purchases per Model A (the 4-cylinder car which succeeded the Model T in 1927) with its about 6,000 parts in 1929 was \$526.84.

COST OF LABOR WITHIN THE FORD PLANT

Mr. McCARROLL. The amount of pay roll and purchases per Model V-8 (which was placed in production in 1932), with its about 16,000 parts, in 1939 was \$683.23.

The CHAIRMAN. I notice that you combine pay roll and purchases. Have you any figures on segregating those two items?

Mr. McCARROLL. Not in this particular report. We combine them for a very definite reason, because the purchases total up to hours of work, and if you don't include both of them you don't get the full story.

The CHAIRMAN. What do you mean by purchases?

Mr. McCARROLL. All material purchased outside and going into the car.

The CHAIRMAN. Is there any way of segregating the two?

Mr. McCARROLL. They are segregated in our records, but we haven't segregated them here because we believed they would be much more informative if we gave them together.

The CHAIRMAN. You do know what the difference is?

Mr. McCARROLL. Yes; it is in the company records.

The CHAIRMAN. Could you tell me approximately what proportion this figure, in each of the two instances, was for labor alone?

Mr. McCARROLL. I haven't that figure here. Mr. Moekle says that we don't have that figure here. It is in the records.

The CHAIRMAN. I understood that you didn't have it. I wondered if you could give an approximate figure.

Mr. FORD. We would be glad to furnish it, Senator.

The CHAIRMAN. You don't care to make an approximate figure?

Mr. MOEKE. The reason we haven't got the figure, and it may be a little difficult to get, is the fact that at different times the volume or the work done inside our factory changes. It goes from inside the factory to outside and from outside to inside.

The CHAIRMAN. I can understand that, but I thought for example you could say whether or not of this sum in 1926, of \$454.42, for example, 50 percent was labor, or 60 percent, or 70 percent. You are probably familiar enough with your figures and your accounting to give us some notion.

Mr. McCARROLL. You will find a figure coming a little later which will give you amount of purchases per unit during two different 3-year periods, and I think we can get the figure you are after by comparing that figure with the figure we have just given you, which amounts to about the figure that Mr. Moekle is talking about now, about 25 percent inside and about 75 percent outside.

The CHAIRMAN. Of labor? Of course it is obvious that when you purchase any material to be used in a motor there must be labor costs combined in that purchase price, because it took labor to produce the commodity or the article somewhere else.

Mr. MOEKE. Roughly about 25 percent of these figures represents labor in our own plants and about 75 percent represents the price paid for materials, services, and so on from the outside.

The CHAIRMAN. Would you say that that proportion held true in 1929 and also in 1939?

Mr. MOEKE. Roughly.

The CHAIRMAN. In other words, the proportion of labor in the factory apparently remains about the same.

Mr. MOEKE. Yes.

The CHAIRMAN. Thank you.

Senator KING. And there is a great deal of labor, however, is there not, in the production of what might be called raw material? For instance, as I understand, the corporation owns coal mines and mineral deposits and operates those, and the costs of labor in obtaining these raw materials would be part of the cost, or the entire cost, of the product.

Mr. McCARROLL. You can really figure every cent paid out goes for labor in one form or another. Figure it all the way back in any material—transportation—

The CHAIRMAN (interposing). Actually, cost of labor is a very large factor in every step of the industrial process, isn't it?

Mr. McCARROLL. You can reduce practically all of it to labor if you want to go back far enough.

Dr. ANDERSON. Just to retouch the question that Senator O'Mahoney has asked, does the modern Ford plant, say the Dearborn plant, do more of its production than the old Ford plant?

Mr. FORD. Do you mean by that that many more parts of the unit are manufactured by ourselves?

Dr. ANDERSON. Proportionately, what would it look like? You say you have about the same labor cost, your purchases and production within your own units are about the same now as they were formerly; but isn't it true that in this intervening period you have integrated your plant tremendously, so that appreciably more of your product is made under your own roof?

Mr. FORD. That is true. We have taken on a great many more parts.

Dr. ANDERSON. Does that mean that you have bought more and more on the outside? Your total is greater now than it was?

Mr. MOEKE. Yes; but the proportion in the total is approximately the same.

Mr. FORD. There is one factor in that that may be illuminating, and that is the fact that there are about 16,000 parts in the car we make today as compared with 5,000 parts in the car we made in 1915.

Dr. ANDERSON. So you continue to buy on the outside about the same quantity of equipment and materials.

Mr. FORD. I couldn't answer that offhand as to quantity but we buy a great amount of material on the outside. We have between 5,000 and 6,000 suppliers.

The CHAIRMAN. What would the answer be in terms of parts themselves; for example, of the 5,000 parts of the Model T Ford in 1926, what proportion were manufactured by the plant itself, and what proportion were purchased from outside?

Mr. FORD. I don't think I can answer that in accurate figures, Senator, but in general there were many more parts purchased on the outside at that time compared with today; we purchased many more things on the outside which we did not make any part of ourselves.

The CHAIRMAN. You purchase more outside today; more of the 16,000 than of the 5,000. Did I understand you correctly?

Mr. FORD. I don't believe so. What I meant to say was that we purchased a great many more parts on the outside in the earlier days than we do now.

The CHAIRMAN. A larger proportion of the 5,000 parts of 1926—

Mr. FORD. Were purchased on the outside.

The CHAIRMAN. Than of the 16,000 today?

Mr. FORD. That is right.

Mr. McCARROLL. Records show that during the past 6 years, both the labor and the purchases per automotive unit produced by Ford Motor Co. have steadily and substantially increased. For example, during the two 3-year periods ending February 29, 1936, and November 30, 1939, the average daily production was almost identical, but average labor-hours performed in the factories increased considerably. The details are as follows:

Period	Average daily production	Total hours	Average hours per unit
3 years ended—			
Feb. 29, 1936.....	3, 276	448, 947, 000	179. 13
Nov. 30, 1939.....	3, 267	507, 294, 000	201. 95

Mr. HINRICHS. In that connection these are total hours in all of your plants for that volume of assembly, I take it?

Mr. McCARROLL. Total hours in the Ford Motor Co. only for that number of units, and then averaged over the number of units produced during those two periods which were selected because they were alike in the volume of production, so you could get a good comparison.

Mr. HINRICHS. During part of that latter 3 years there was a tire plant that was producing part of your tire requirements?

Mr. McCARROLL. That is true.

Mr. HINRICHS. That extension of your activities would be included in that larger number of hours?

Mr. McCARROLL. That undoubtedly accounts for part of that difference there, but when you consider the figures we mentioned before when we include both purchases and hours within the plant, and dollars for this plant, you will see why we used that combined figure as being the more important and the more informative one, because it takes out of all consideration just points such as you just raised then.

Mr. HINRICHS. I judge from your earlier answers that on balance you feel you are doing about the same proportion of outside purchasing in these two periods. Would that be correct?

Mr. McCARROLL. I believe that is true. Furthermore, the following figures also taken from the company's records, for 6 calendar years, clearly show that accompanying the increase in the average hours of labor per unit there has been a gradual increase from year to year in the labor cost per unit produced. These figures are the more significant in view of the fact that even in 1934 the minimum daily wage paid by Ford Motor Co. was \$5, the minimum being raised to \$6 the following year:

Calendar year:

*Labor cost
per unit*

1934-----	\$119.41
1935-----	130.01
1936-----	145.24
1937-----	160.99
1938-----	190.39
1939-----	197.84

Dr. ANDERSON. Mr. McCarroll, just at that point, may we go back to the previous question. Your labor cost per unit is per unit, such as the vehicle. I understand you have gone into extensive tire production. You have developed a foundry; you are doing more of your own rolling of steel. If you took out all those things for all years in the trend would you still hold that the cost per vehicle for labor is greater now in the Ford plant than formerly?

Mr. MCCARROLL. Yes, sir.

Dr. ANDERSON. Could you give an approximation of the amount?

Mr. MCCARROLL. No; I can't; without the figures.

Dr. ANDERSON. Could you supply us with such a figure? It is a very important one, if we can get it.

Mr. MCCARROLL. Mr. Ford says he would be glad to. The figure is here.

Representative REECE. But the amount of labor required to produce the unit would be the same, whether it was done in your company or done in another company from which you purchased.

Mr. MCCARROLL. Approximately. The thing that influences that increase is, of course, the thing Mr. Ford mentioned a minute ago, that every year there are added parts, not only a few but a great many, and that is the thing more than anything else that is affecting the increase in labor-hours going into the car and in money cost of the car.

Representative REECE. But based upon your experience the amount of labor required to produce the parts is approximately the same whether the parts are produced in your plant or some outside plant from which you purchase the parts?

Mr. MCCARROLL. As a general rule that would be true. Of course it would be affected by the efficiency of the equipment that two people might have.

Representative REESE. What I have in mind, and what I am driving at is in a general way the amount of labor that is required to produce a unit.

Mr. MCCARROLL. That would probably be on an average quite true; yes.

PROPORTION OF SKILLED TO UNSKILLED WORKERS

Mr. HINRICHS. These figures I understand represent the total number of man hours of labor required by an increasing number of parts and the average hourly earnings of the workers engaged in that process, and your wage rates have obviously increased in this period. I am interested also in the change in the internal composition of the labor force, irrespective of its relationship to wage rate. For example, has there been a tendency not only within this period but over a longer period of time, to decrease the proportion of skilled workers and increase the proportion of semiskilled and unskilled?

Mr. MCCARROLL. I think you will find there are some questions directed toward that answer later on, and suppose we cover it by our

answers there and if that is not sufficient, why then we will be glad to try to answer further.

Mr. HINRICHS. I am sorry to have anticipated you.

Mr. FORD. I think there is one point that might be added on that subject which might clarify that in a very simple wording, and that is the fact that the average or lower minimum rate has remained more or less static. Our average wage has gone up consistently, indicating more skilled pay.

The CHAIRMAN. I didn't hear that statement, Mr. Ford.

Mr. FORD. The question was asked as to whether the labor cost of the car was paid out to more highly skilled workmen, or whether, due to the improvement of processes, we were employing more unskilled labor.

The CHAIRMAN. And what was your answer?

Mr. FORD. My answer to that was that our average wage is on the increase continuously. That would indicate these men are becoming more skilled and are receiving higher rates.

The CHAIRMAN. Then the answer would be that skill is increasing?

Mr. FORD. More skilled men are involved at the present time than in the past.

Dr. ANDERSON. Mr. Ford, would your consistent average increase in wage rates indicate a change in the composition of skills used or would it mean simply in the over-all increase in wage rates, regardless of skill? How do you make the direct connection between the wage-rate increase average and the increase in skill of workers employed?

Mr. FORD. The lowest rate, our minimum rate, applies to only the most unskilled labor, sweepers, cleaners, and common labor. Every other classification of rate is based on skill. These men are classified, based on the skill of the job. Now, of course, the trend has been upward for the last several years; the general scale is on the upward turn.

Dr. ANDERSON. You would say two things are at work; the average wage rate in your opinion is moving up and also the composition of your labor force is altering with more skilled workers employed, relatively?

Mr. FORD. Yes; I would think so. There is less hand labor and less unskilled labor involved and more semiskilled.

Senator KING. With these improvements upon your car, of course, it calls for a larger proportion of skilled labor, I assume, and that—

Mr. FORD (interposing). Yes; the fit and technique is becoming more complicated and involved all the time. We are putting things into our product which will make for a great deal longer life. All those things are highly technical and highly developed, which calls for more skill.

Mr. McCARROLL. The foundry department is noted for the vast amount of technological improvement and installation of so-called labor-saving machinery. Therefore, it seems of interest to present below, figures on the number of men employed in this department in the years listed, showing also amount of production at those times.

Year	Production	Number of men	Men per car	Year	Production	Number of men	Men per car
1933.....	414, 953	2, 345	0.0057	1937.....	1, 117, 241	7, 330	0.0066
1935.....	1, 193, 121	6, 311	.0053	1939.....	803, 751	6, 310	.0079

The CHAIRMAN. What is the unit of production?

Mr. McCARROLL. The unit of production is in the foundry where there is a number of motors produced during that period.

The CHAIRMAN. This, then, refers to the production of motors?

Mr. McCARROLL. This refers to the production of motors.¹

The CHAIRMAN. Thank you.

Would it be a proper inference that the increase of men per car in 1939 is due rather to the decreased production than to the difficulty of production?

Mr. McCARROLL. It undoubtedly has something to do with it, but the thing we have mentioned before comes into it there; for instance, in the foundry we cast a great many of the motor parts. In that year we started putting these valve-seat inserts into intakes as well as the exhaust. Well, now, that just doubles the number of those parts that we make every day and there are a good many other parts that come under that same kind of heading.

The CHAIRMAN. So both factors would operate?

Mr. McCARROLL. Both factors would operate.

Dr. ANDERSON. There must be a third factor. Supposing you put in a column on hours worked so as to get at the actual technological effect of change; the hours must have been changing during this period of time?

Mr. McCARROLL. Yes.

Dr. ANDERSON. It is true that your over-all number of men increased there, but the difference in working time would have an unusual effect, a decided effect upon that last column of men per car?

Mr. McCARROLL. That would go back to the figure which we have used in the case of the whole plant, of the number of man-hours per unit. We stated this in a slightly different way here, and we stated it in the other way in the case of whole units because this would be interesting information.

Dr. ANDERSON. And could you supply us with the man-hours for this particular division?

Mr. McCARROLL. We could.

Dr. ANDERSON. That would fit into a column there. Also, is there any way of measuring under this tabulation, not on the basis of motor production but on the basis of the product of this particular division of the plant, so as to get at the measure of technological increase?

Mr. McCARROLL. Yes, sir; it would be possible to get that.

Representative REECE. And, Mr. Anderson, if he supplies that information, might it not also be helpful if he would supply the labor costs?

Mr. HINRICHS. Would the figures for the assembly line for the assembling of the motors show the same story that your foundry story has; that is, this, like any other partial piece of work, represents a changing situation with respect to your materials purchased. As those are increased and decreased, obviously your own hours show a similar change?

Mr. McCARROLL. Yes.

¹ In a letter dated April 29, 1940, from the Ford Motor Company, Mr. Moekle says, regarding this table, "The unit of production is cars produced rather than motors, as Mr. McCarroll stated. However, the theory under which we were working called for the production of cars; and we believe our use of cars rather than motors is better."

Mr. HINRICHs. Your assembly of the engine has always been done within your own establishment. Does the assembly line for engines show the same results, or could you supply similar figures for the assembling of engines?

Mr. McCARROLL. Usually it would show the same result.

Mr. FORD. I don't quite get the drift of the question. As I understand it, the question is whether in the assembly of motors there is more stability to the cost per man, or the man cost per motor as compared with the complete car, as these figures show.

Mr. HINRICHs. Well, I wasn't thinking of it in relationship to the complete car, but rather as possibly a more clean-cut illustration, less subject to variations in terms of what you were purchasing on the outside. Obviously every time you shift your practice with reference to the foundry department, as you manufacture internally, your hours or man-days go up. As you purchase on the outside, they go down. Your assembly on the other hand has throughout this period been done completely within the confines of your own company, and I was wondering if the assembly of engines would show this same kind of relationship you have here.

Mr. FORD. There are more parts being added to the engine all the time, which would tend to increase the labor cost per engine, I suppose, due to refinements. As Mr. McCarroll mentioned, the bushings that go into the seats of the valves, these cylinder liners that we are putting in now, which are very hard steel liners, and go in all the cylinder barrels, and various things like that weren't in an engine 10 years ago. That keeps adding to the cost of that assembly for additional parts.

Mr. HINRICHs. And similar things have added to the costs of the manufacturing operations in the foundry?

Mr. FORD. Oh, yes.

Mr. HINRICHs. You have been processing more parts in the foundry. None of these exhibits are intended to indicate that a given part requires more man-hours on higher labor cost today?

Mr. FORD. Probably they require less man-hours, but the product becomes more and more complicated all the time and there are more parts being added.

Mr. HINRICHs. I understand that.

Mr. FORD. And the refinement is becoming greater.

Senator KING. As I understand, many of the parts which are involved in the construction of an automobile you purchase from other manufacturers of parts, if not entire plants. I assume you can't control the costs of those commodities that you purchase from other people?

Mr. FORD. Those costs are controlled by competition. We have several sources for practically every part we buy.

Senator KING. But some of the parts which from time to time you purchase from other persons you have to pay higher prices for by reason of the competitive demands, and that necessarily increases your aggregate cost?

Mr. FORD. Naturally.

Senator KING. For the car?

Mr. FORD. But if those prices on the outside increase there is some basic reason for it which would perhaps apply to other things we buy, and also to our own.

The CHAIRMAN. What has been the trend of prices of the outside parts?

Mr. FORD. That varies with the design. If we were buying today the part that we bought 10 years ago we would be buying it at a very much lower price probably than we bought it at that time; but the fact is that we are buying an entirely different type of part, which goes into a different vehicle.

The CHAIRMAN. Then the price tends upward because of the improvement, does it?

Mr. FORD. The price per unit is upward, yes; and the price per part. If the same type of part were being bought today that we bought 10 years ago, the tendency would be that we are buying it probably at a less price than we did then because of refinements in manufacture.

Senator KING. But you are making better cars and with better parts?

Mr. FORD. Spending more time on parts; better raw materials going in, which cost more, and much better finish; much more inspection.

Senator KING. And the finished product calls for more technological improvement and higher costs with respect to some of the parts that go into the car?

Mr. FORD. A great deal.

Senator KING. And what is the effect upon the final price to the consumer?

Mr. FORD. Well, the price trend has been somewhat up as compared with the old model T and model A, which we built, but it is still competitive.

The CHAIRMAN. It is a much better car?

Mr. FORD. Competitive; the whole trend is that way. No longer what you might call a very low-priced motor car. The public apparently demands lots of room and lots of power.

The CHAIRMAN. Of course, your company was the pioneer in the low-price field?

Mr. FORD. Yes.

The CHAIRMAN. And you are still in the low-price field, of course, although the tendency of the price may be upward because of the improved character of the car?

Mr. FORD. The whole field has risen. The whole low-priced field has risen; the price of the vehicle.

The CHAIRMAN. But still the level of price is lower than before the pioneering effort of your father began; isn't that correct?

Mr. FORD. The level of the price is higher. You mean when large volume started? Oh, yes; surely.

The CHAIRMAN. And the reason why it was possible to produce the original Ford car for a low price, in other words, the reason that your father was able to pioneer in this field was that he was able to tap a much larger market than the high-priced car could tap?

Mr. FORD. Oh, quite, and that was only possible with low prices.

The CHAIRMAN. So that after all the basic cause for the expansion of the industry has been the lowering of the price to reach a larger number of possible purchasers?

Mr. FORD. That is right.

The CHAIRMAN. So that the market is the essential factor in the growth of the industry?

Mr. FORD. That is quite correct.

Dr. ANDERSON. If that is true, Mr. Ford, and in the light of your statement of a moment ago that there is no low-priced car in the sense of the earlier product of your father, what do you think is the prospect of a new car in the low-price field that will fill that gap, that will reach that purchasing mass we have been speaking of who cannot at the present time buy even the low-priced new cars?

Mr. FORD. There have been several factors that have entered into that problem since the day that we built a very low-priced car. The first one was that those cars were being sold to original owners to a great extent, to people who hadn't owned a motorcar before. In the meantime they purchased that car and many others, and have created a used-car field, used-car market. Now the used car is merchandised by a dealer, and his market for that used car is the man who formerly bought a new car in that very low-priced field. He is in the \$200 to \$400 class for a used car.

Dr. ANDERSON. You leave the person with low purchasing power the used-car field rather than attempting to provide him with a new unit, giving him all the efficiency of a new unit?

Mr. FORD. That is the way it exists today. We have hopes that some day we will have a low-priced unit again that will supply the purchaser with a new car at a lower price and a more efficient operation than in the past.

Dr. ANDERSON. Is there any technological reason why that hope couldn't be realized shortly?

Mr. FORD. None whatever, except the question of buying power, whether there is a sufficient volume of buying power in that field to warrant a low-priced product which can be produced only in large volumes.

A \$500 AUTOMOBILE

Dr. ANDERSON. In other words, if you could see a market for 1,000,000 to 2,000,000 cars a year, say at \$500, you could produce the car?

Mr. FORD. We could produce the car all right; yes.

The CHAIRMAN. Now just to repeat what I understand you to have said, an increased market for technological advance depends upon an increase of purchasing power; is that correct?

Mr. FORD. Mass purchasing power.

The CHAIRMAN. Mass purchasing power?

Mr. FORD. I believe so.

The CHAIRMAN. That is the essential need for further technological improvement?

Mr. FORD. I believe so.

Mr. McCARROLL. In the Ford Motor Co.'s exhibit at the New York World's Fair, there was in operation a display illustrating how machinery creates employment. Perhaps this may have been seen by members of the committee. There, side by side, a man was pounding out hub caps by the slow hand method and a mighty progressive machine was stamping them out with great rapidity. The man made one piece while the machine made 2,160 pieces, and at first glance it would seem that this machine might eliminate 2,159 jobs, but a study of the figures proves otherwise.

Representative REECE. Will you permit a further interruption? I am interrupting to refer particularly to the summation which the chairman made. He stated that the ability to make a low-priced car and sell it would depend upon mass purchasing power, but what would the effect be if our standard of living had been raised so that when this mass purchasing power came about the people demanded a better car than was the case when you produced your original low-priced car? Would it then result in the production of a new low-priced car or an increased volume of cars comparable to the present so-called low-priced cars?

Mr. FORD. We feel there is always a field way down below that everybody in the world wants a motor car. It is a question of being able to afford it, and we feel the lower the price of a motor car adequate for general use, the greater the market will be. If the cost of living, the standard of living, had been higher—you mean if it were higher than it is today or had been higher in the past? I didn't quite get which you meant.

Representative REECE. I might state it this way. We have a greater mass purchasing power today than we did when your father produced the original low-priced cars, but with this mass purchasing power is going a demand for a better car, for better service, which you are supplying in accordance with the demand?

Mr. FORD. Yes, that is true. We are supplying the demand as it exists today among the class of people that can buy new motor cars. There are strata underneath buying used cars. We feel that if a low-priced new car were produced to fit that price class they would buy those cars rather than the used cars, because of the increased efficiency. There is still a great mass of buying power underneath the present standard.

Representative REECE. I agree with you in that statement.

Dr. ANDERSON. Mr. Ford, then I take it that the future of the automotive, the new car building, industry at the present time, unless you can tap a new consuming public, is inseparable from the sale of old or used cars?

Mr. FORD. It is inseparable because those old or used cars exist and they have to be disposed of. The unfortunate part is that the dealer takes them in as part allowance on his new car. If the dealer could make a clean case deal, or clean deal without the used car being involved he would be a lot better off, perhaps, than he is, because he takes those used cars in and it is somewhat of a gamble as to the salability of them. He either fixes them up, or sells them as is, and there is an element of risk involved and the tendency is to over-allow sometimes on that used car.

The CHAIRMAN. That is wholly the risk of the dealer, isn't it? It isn't passed on to the manufacturer?

Mr. FORD. The dealer takes that risk, entirely.

The CHAIRMAN. He is the judge of how much he shall allow and he takes the gamble as to what disposition he can make of the used car?

Mr. FORD. That is right. Of course, there is a great amount of skill involved in that in appraising these cars.

The CHAIRMAN. Oh, naturally.

Mr. FORD. But the sales factor has a lot to do with it, too. If the salesman has a deal about ready to break and there is a question of

\$25 or \$50 between the appraisal of this used car and what the owner expects from it, well there is sometimes a compromise and the dealer therefore makes the sale but he gives up part of his gross profit.

NEW VERSUS REPLACEMENT CAR MARKET

Dr. ANDERSON. Mr. Ford, following up that question I asked a moment ago, I notice in the *Automobile Facts and Figures* recently published the heading of a table that spans a long period of time, showing that in the last year, 1938, the replacement market took all of the new cars sold in the United States. In other words, new customers in the over-all, people who did not own cars, did not appear in the shops in sufficient numbers to offset the replacement market. They balanced. Everybody coming in turned in a car in order to buy a new one. Now, if that becomes a trend, does that offer any hazard to the market for new cars in the United States?

Mr. FORD. It may.

The CHAIRMAN. Do you agree with that premise, Mr. Ford? I thought I saw Mr. McCarroll shaking his head.

Mr. FORD. I don't know what those figures are.

The CHAIRMAN. The statement as I gather from Dr. Anderson is that the original purchaser has apparently disappeared from the motor market. Is that true?

Mr. FORD. Well, I wouldn't think it were true 100 percent; no.

Senator KING. That can't be true in view of the fact that you just a day or 2 ago turned out your twenty-eight millionth car.

Mr. FORD. Mr. Moekle said 15 to 20 percent don't turn in cars.

Mr. MOEKLÉ. I don't know the exact figures but we do know some percentage, 15 or somewhere around there, of what we call clean deals, that is purchasers come in and buy cars without trading in an old one.

Mr. FORD. Those people may have disposed of their car before the deal, before they came to the dealer for a new car.

The CHAIRMAN. But the replacement factor is a constantly increasing one, is it?

Mr. FORD. Increasing problem. Until a new field is tapped by lower prices.

Mr. HINRICHS. At lower prices, the market now is certainly not saturated. You wouldn't contend there is a saturated market?

Mr. FORD. I wouldn't, by any means. As I said before, everybody wants a motorcar. It is a question of whether they can afford it. If you lower the price, the greater the field.

Mr. HINRICHS. About one-third of the families at \$900 to \$1,200 buy a car; about half of those at \$1,200 to \$2,000 have cars; so that at lower prices there is a presumption of a vast untapped market, isn't there?

Mr. FORD. I believe so.

Mr. HINRICHS. Now, development of the Ford Motor Co. in recent years has been in the direction of tapping that market through lower prices and lower costs? Or have they been rather in the direction of giving the existing market a better product at essentially the same price, slightly higher slightly lower?

Mr. FORD. The latter is what we have been doing of late. We haven't attempted, of course—we naturally wish to reduce the cost of the car as we can, but we are not taking parts off the car to do it. We are adding all the time to the refinement of the car, because we feel that is the car that is in greatest demand at the present time.

The CHAIRMAN. The table which Dr. Anderson referred to is taken from *Automobile Facts and Figures*, published by the Automobile Manufacturers Association, twenty-first edition, for 1939, and this table would indicate that in 1930, '31, '32—in those 3 years, there were no new buyers and multiple car owners and that the replacement market took up all of the cars sold in the domestic market; that in 1934, '35, '36, and '37 new buyers appeared again in increasing proportion but disappeared wholly in 1938.

Mr. FORD. 1938 was a bad year; 1937 was good; and 1939 was much better than '38.

The CHAIRMAN. It would appear from this table that the disappearance of the original purchaser is accounted for by the poor years.

Mr. FORD. I should think so.

The CHAIRMAN. In every other year there is a substantial original purchaser market.

Mr. FORD. Yes.

Dr. ANDERSON. It might be added that the chart shows, and figures tend to bear out the fact, that while the trend is not constant downward trend of new purchasers, there is a tendency that corroborates your point that somebody has to find some way of tapping new purchasing markets for low-priced cars.

Representative REECE. If the present car owners, however, were unable to trade their old cars in, that is, if the market was not available for the used cars, they themselves would use their cars for a longer period of time and not buy as many new cars as they do at this time?

Mr. FORD. I believe that is true, and then when he did dispose of them he would have to dispose of them at a lower price.

Representative REECE. Dispose of them at a lower price or they would go to the junk heap?

Mr. FORD. Any introduction of a new low-priced car will have a very drastic effect on the used-car market. It will tend to lower the whole range of used cars definitely.

Representative REECE. And from the utility standpoint many of the used cars which are taken in by the companies are very useful.

Mr. FORD. They are useful?

Representative REECE. Yes.

Mr. FORD. They are transportation, but they are not sufficient transportation, as the new car is perhaps.

The CHAIRMAN. You don't expect to have him say the used car is as good as a new car?

Representative REECE. I included the words "had a high utility value." They give us luxury and comfort that our old car didn't have, if it is only 1 year old; although our old car is 1 year old, and we feel the urge for a new one, it still runs very successfully and gets us back and forth without any difficulty, so strictly from utility standpoint it serves the purpose.

FEASIBILITY OF LOWER-PRICED CAR

Mr. HINRICHS. Mr. Ford, you mentioned the fact that the used-car market might be seriously disturbed for a period of, I take it, several years during a transition to a really low-priced car. Has that factor played an important part in your considerations as to the businesslike feasibility of introducing a low-priced car at any time?

Mr. FORD. It has been one of the factors that we have considered right straight along. I don't think it would perhaps stop us from producing a job of that kind when the time comes, because we feel that perhaps a situation of that kind might take care of itself. There will be some losses involved, of course, but there will be greater profits and greater benefits when the thing has stabilized itself and worked itself out. It isn't an element that prohibits us from doing it. There have been many other factors besides that one.

Mr. HINRICHS. Technically, you can do the job?

Mr. FORD. I believe so.

Mr. HINRICHS. What is the chief inhibiting factor?

Mr. FORD. We have felt with the vast number of unemployed people and the depressed state of the farmer, and so forth, that there perhaps wasn't the buying power for that type of car that there might be later on.

The CHAIRMAN. The chairman intervenes now, noting that Mr. McCarroll has read only a small portion of the original statement. Perhaps we might expedite the presentation if we permit him to proceed and then we will ask the questions later on.

Mr. McCARROLL. Thank you. The automatic machine produces this part at about \$0.12 each, but there was spent \$115,000 for the machine and dies.

The first point to consider is that machinery begins to create employment before it goes into production. Divide the cost of the press by a day's wage, say \$7, for every dollar of material cost is ultimately reducible to someone's work. At this rate the press and dies represent 16,428 days work.

Next consider making the article by hand. A man can be equipped with hand tools for \$24. This would seem to be a big saving over the \$115,000. But the \$24 must be multiplied by 2,160 which would be \$51,840. Then there would have to be a factory to house those 2,160 men which would cost at least \$500,000 for the building and land, and about \$83,000 per year for maintenance, heat, light, and taxes, making a total of \$634,840. Now, as a practicable business matter, such a development could never be realized, but imagine that this were done and that the hand worker could turn out 2.7 parts in an 8-hour day, then the part would cost about \$2.50 each, as against \$0.12 on the machine. If this practice were followed throughout all the manufacture of an automobile, it is calculated that the cost of making a Ford car would exceed \$17,000. At such a cost, not more than about 50 cars a year would be sold. There would not be work for more than 1 of the 2,160 men, none for most of the more than 125,000 men now in the Ford industry alone.

Could this be avoided by paying for the hand work just what it would be worth by comparison? Hardly, for under that arrangement a man on this job would earn about \$0.18 per day.

Three million men are normally employed in making, selling, and servicing cars, because, with machinery, cars can be produced at prices people can pay. And that, in turn, creates jobs at wages that enable people to buy. The cars, the jobs, the wages would not be there, were it not for machinery.

Some who object to machinery still think they have a point. They say "We'll grant that we need the machinery we have now, for it has created most of the jobs there are today. But let's not have any more. Let's freeze things as they are and keep the jobs we have." In the opinion of this company's management, that again shows a lack of understanding of the way things work. There is no point in saying that manufacturing costs are constantly cut by taking certain men off certain jobs because better machines have made those men unnecessary on those particular jobs. But that does not mean that the total number of jobs has been permanently decreased. The Ford Motor Co. has been cutting costs for many years, but as has been shown, there are many more man-hours of work in today's Ford car than in the model T or model A. Cutting costs enables the company to put more in the car, and it takes more men to put it there.

In the following table figures comparing 3 separate 12-month periods which had a similar average daily production, it will be observed that there has been a progressive increase in both the total hours of labor and in the average hours per automotive unit produced.

Period	Average daily production	Total hours	Average hours per unit
12 months ended—			
Jan. 31, 1935.....	3, 074	146, 373, 000	186. 74
Apr. 30, 1938.....	3, 115	168, 790, 000	211. 64
Nov. 30, 1939.....	3, 069	173, 668, 000	220. 18

With regard to purchases the following figures from the company's records for the same two 3-year periods referred to earlier show that during the same time that labor hours and labor cost per unit were increasing, the amount of purchases per unit produced also was increasing.

Period	Average daily production	Purchases	Purchases per unit
3 years ended—			
Feb. 29, 1936.....	3, 276	\$1, 198, 609, 000	\$478. 24
Nov. 30, 1939.....	3, 267	1, 259, 242, 000	501. 30

These purchases were exclusive of those for plant facilities.

Here, reference is suggested again to the Government publication, Background 1940 Census, page 4, chapter 4, but it is asked that the

whole text be read, rather than just the heading "New Products Hurt Old Ones" which seems misleading.

For instance while certain silk fabrics declined from 336,000,000 square yards in 1927 to 109,000,000 in 1937, rayon fabrics advanced from 66,000,000 square yards to 947,000,000 square yards.

This shows a net gain of 604,000,000 square yards.

Electric stoves and ranges more than doubled while gas cooking stoves and ranges declined only slightly. Electric clocks rose nearly 50 fold in 10 years while other clocks declined by half.

And on page 5—

Probably no figures in the manufactures census tell more as to the changed habits of Americans in transportation than those having to do with automobiles, carriages, and wagons. In 1904 we made only 20,000 passenger motor vehicles but then we made 937,000 carriages, buggies, and sulkeys. In 1937 we turned out 3,847,000 passenger motor cars and only 900 buggies. Horse-drawn wagons reduced from 644,000 in 1904 to 108,000 in 1937 and motor trucks rose from a production of 160 to 602,000.

Many other figures can be gotten from this Government Publication which, it seems, further justify opinions expressed herein on the subject under discussion.

It is also suggested that note be taken of Mr. Justin W. Macklin's (First Assistant Commissioner of Patents) article in *Nation's Business* for January, 1940, under the title, "Labor Saving Machines Make More Jobs."

Question 2. What does the size of industrial unit, the type of ownership or management, and the kind of industry have to do with the rate and character of technological change?

Answer. Regarding size of unit, you are referred to the answer to "Effect on Investment"—question No. 2.

Regarding type of ownership, it is believed that results may be much more quickly accomplished where efficient compact management is demanded and developed and such management is given a free hand than where, due to an unduly complicated corporate structure, much red tape must be gone through before a development may be started or carried through.

Regarding the "kind of industry," it is preferred to confine remarks herein to experiences in this company for obvious reasons.

Question 3. What kinds of technological change result in permanent displacement of workers?

Answer. This company has no knowledge of any technological improvement that has resulted in the permanent displacement of workmen, in the sense that generally cooperative willing workmen cannot thereafter find employment. If there are isolated individuals seriously affected, undoubtedly they should be and can be compensated without impeding for the use of civilization generally the great benefits of new developments.

Question 4. How many and what kinds of workers are displaced by technological changes in particular industries, and what becomes of them?

Answer. As far as this company's information goes, there is no known permanent displacement of workmen in this industry, as under normal conditions they are absorbed in jobs created by one or another technological change.

Question 5. What is the annual volume of technologically displaced workers in particular industries? What is the aggregate effect of technological displacement on the labor force employed in these industries?

Answer. In this industry there has been no permanent displacement.

Question 6. What is the effect of technological change on occupational skills, individual earnings, and social-economic status of workers?

Answer. The technological change has increased occupational skills, increased individual earnings, and improved the social-economic status of workers.

Question 7. What is the effect of technological change upon various age groups and sex groups of workers?

Answer. Technological change has made possible the use of men older and with less physical strength. This company has use for very little female labor.

EFFECT ON SOCIETY

Question 1. What are the effects of technological development in the "one-industry town?"

a. On employment.

b. On pay rolls.

c. On community agencies and activities.

Answer. As some members of the committee may already know, the Ford Motor Co. has 14 small plants located within a radius of 60 miles of Dearborn, in an effort to help rural communities by the decentralization of industry where possible. This is its only direct contact with "one-industry towns." Where technological change has affected these plants, it has been found both convenient and desirable to make arrangements to maintain or increase the amount of labor in those places.

TECHNOLOGY AND MIGRATION OF INDUSTRY

Mr. McCARROLL. Question 2. With technological change having made possible standardization of industrial processes, what is the effect on the migration of industries? What causes these migrations? How do they occur? What do they leave behind them in the way of social, economic, and human gains and losses? What do they accomplish in these respects in their new location?

Answer. This company has had little direct contact with the migration of industry. So that its industry at Iron Mountain, Mich., might not "migrate" from there when the average amount of wood decreased from about 350 pounds per car to 34 pounds per car, other jobs, such as the station wagon assembly, were moved to our Iron Mountain plant.

Question 3. What is the extent and character of the bidding made by States and localities for the transfer of businesses? Is there need for economic and social policy to mitigate or eliminate the undesirable features found in this situation?

Answer. No experience has been had with the bidding of different localities for transfer of business. In a few instances benefits offered locally to any new industry have been received, but the decisions to

establish this company in such places were dictated by other considerations.

Question 4. How successful are public and private agencies in meeting the problems of vocational training and placement, retraining and replacement of workers?

Answer. At the company's main plant, it maintains its own training schools with more than 2,000 students. This has been advantageous both for the students and the company.

Question 5. Is technological development resulting in degrading or upgrading of workers? In either case, what is the effect on purchasing power and standards of living? Is there need for the formulation of social policy in this connection?

Answer. It is believed technological development is resulting in upgrading of workmen. It makes for increased purchasing power and increased standards of living. The laws of cause and effect and the natural desires of businessmen and employees for improvement from every social angle are accomplishing this without a formulated social policy.

Question 6. How successful are the various industrial plans for spreading work, annual income payments, wage-and-hour adjustments, in-service training, intraplant shifting, etc., in adjusting the labor force affected by technological change? Is there need for legislation along these lines?

Answer. It is believed that this company has been very successful in these matters under the conditions, and that it will continue to improve its handling of them. The company strives to lead in improvements along these lines. It does not believe that new legislation is necessary or helpful to these ends.

Concerning Ford plant extension and replacement, the records show an outlay for the past 6 years of \$169,152,000. Plant equipment scrapped or otherwise disposed of amounted to \$96,682,000. Yet, at the end of 1939 after these important improvements in plant were made, employment by the company, for a like volume of production, stood at a 10-year peak of approximately 125,000 men. During the years 1927 to 1929, inclusive, the company's annual gross outlay for replacement or expansion purposes was \$36,000,000.

It is believed that the foregoing comparative figures taken together establish definitely that employment by Ford Motor Co. during the past 6 years has not been affected adversely by any possible technological reaction. On the contrary, the company, even with improved working facilities, has steadily employed more men, paid out more in wages, and purchased more materials per automotive unit produced.

The CHAIRMAN. Do you care to ask any questions now, Dr. Anderson?

COST OF PRODUCTION AS MEASURE OF EFFECT OF TECHNOLOGY

Dr. ANDERSON. Well, Mr. Ford, before moving over into this very interesting retooling story, I would like to ask two or three questions concerning parts that we covered here and didn't ask questions about. In answering the question as to the effect of technological change on the volume of production, the number of workers employed in that production, and the volume of wages paid, you listed 3 periods of time and the number of parts used, and each period showed an

increase in the amount of pay rolls and purchases of cars. The last statement is, "The amount of pay roll and purchases per model V-8 (which was placed in production in 1932) with its about 16,000 parts in 1939 was \$683.23." What is that, the V-8 "60" or the V-8 "85"?

Mr. FORD. I couldn't say as to that. There is very little difference.

Dr. ANDERSON. So there won't be any significant difference in one or the other?

Mr. MOEKLE. It is a composite.

Dr. ANDERSON. Then I take it the \$683 means the total cost in terms of pay roll and outside purchases, but not in terms—

Mr. FORD (interposing). All purchases for production.

Mr. MOEKLE. It is not the cost per car. It is the amount of purchases and pay roll per unit produced.

Dr. ANDERSON. Per car produced.

Mr. MOEKLE. Which includes, of course, materials that are resold or sold as service parts. It wasn't possible to segregate that.

Dr. ANDERSON. What proportion of your total production would that be?

Mr. FORD. Service parts?

Dr. ANDERSON. Would it run anything like 15 to 20 percent?

Mr. FORD. It runs about \$10,000,000 a month, but I can't tell you what it is in number of parts.

Mr. MOEKLE. I suppose 10 or 15 percent is somewhere near.

Dr. ANDERSON. Then, in other words, to get the production cost of that car you would have to deduct parts and accessories sold for replacement or sale on the outside.

Mr. MOEKLE. Yes. This wasn't made with the intention of showing the cost per unit. It was made to show the trend of purchases of labor and materials per unit.

Mr. FORD. More and more going into the unit as years go on.

Dr. ANDERSON. It goes beyond that. If there are 10 to 20 percent of accessories in here, the unit basis of production will not be a suitable one for determining change over a period of time. You would have to take out this element.

Mr. FORD. Those parts are all manufactured; they involve labor.

Dr. ANDERSON. But they don't involve labor on that particular car. The measuring unit is a bad one at that point, isn't it?

Mr. MOEKLE. We thought it was all right.

Dr. ANDERSON. I want to lead you to a curious point, then, if it is all right. Your cost here is \$683, and according to the Federal Trade Commission's report your V-8 "60" at that time was selling for \$666, f. o. b. your factory.

Mr. MOEKLE. This is not the cost.

Dr. ANDERSON. So your costs were above your f. o. b. selling price.

Mr. FORD. This is not cost. This is a lump sum of all the material and labor for a given period, divided by the number of cars, and we only did that for comparative reasons. It has nothing to do with the actual cost of the car at all.

Dr. ANDERSON. And to get at the actual cost of production you would have to proceed in quite a different way?

Mr. MOEKLE. Somewhat different; yes.

The CHAIRMAN. What are the differences which produce the different figure? If we are not to regard this as cost, why not?

Mr. MOEKE. The difference is, altogether, that this includes all purchases and all pay rolls, and a certain amount of the purchases and pay rolls goes into service parts, parts that are sold, service parts and accessories that are sold separately from the car.

Mr. HINRICH. This would also include, I take it, materials put into inventory for the time being; that is, all material purchases during a calendar period.

Mr. MOEKE. It would.

The CHAIRMAN. There is no duplication?

Mr. MOEKE. There is no duplication.

Mr. HINRICH. Suppose the proportion of your repair parts or replacement parts, and your inventory within a calendar year, would change from one period to another. They are not constant. There may have been a higher proportion of repair part production in 1938 than in 1929, with which you are making a comparison.

Mr. MOEKE. If inventories were proportionately different in one period and another, it would make that difference.

Mr. HINRICH. Actually, in 1939 you were somewhat building up inventory, weren't you, in anticipation of 1940?

Mr. MOEKE. I don't think so.

Mr. FORD. Not abnormally.

Mr. MOEKE. Not abnormally. We don't have accurate figures here, however, on that point.

Dr. ANDERSON. My point, Mr. Ford, was that the question concerned the effect of technological change on the volume of production and the number of workers employed in that particular production. To answer that question, we need some measure—some unit—which eliminates as many fallacious elements as possible.

Using the measure you do, it would be possible that in your plant you had gone into businesses quite removed from the production of automobile units and thereby swollen your number of workers employed and the volume of wages paid. In other words, the character of the business would have much to do with the figures in the over-all. My point, therefore, is that only on the basis of some comparable unit, such as actual motor cars produced, could we get at a measure of the effect of technological change on volume of production or upon the number of workers employed.

Mr. FORD. You feel that this example isn't quite an accurate one?

Dr. ANDERSON. I wonder if you consider it precise enough to get at such a question.

Mr. McCARROLL. Don't you think that in some ways it is better, because, although such parts as the radios and heaters are included under what we call parts sold separately from the car, they are a very definite part of the car and a very definite part of the labor that goes into the making of the car, and it is just those extra things that are being put on the car, both as regular production and as service, if you like, units, that are helping to cause this increase in the amount of labor in the car.

Dr. ANDERSON. In other words, you don't have any figures to show what the trend with respect to replacement parts and accessories is.

Mr. McCARROLL. We haven't separated that figure in here.

Dr. ANDERSON. You see it could reasonably be, Mr. McCarroll, as there are more old cars on the market, that we have an increase in replacement-part business that becomes a vital part of your total

business. You say it already amounts to some \$10,000,000 a month, which would mean an appreciable part of the total.

Mr. FORD. It doesn't fluctuate very much.

Mr. BIGGE. Isn't there much more change over a period of time due to the change in the model itself rather than the proportion of total cost that is spent on the replacement parts, and so on, in connection with your outstanding cars? It seems to me the major change is in the character of the car that you are turning out.

Mr. FORD. The unit is building up all the time.

Mr. BIGGE. And you can't compare today's costs of producing a model T with the 1924 cost of producing a model T because it isn't produced today.

Mr. FORD. Here is one instance which is rather illuminating. The demand for remote-control gear shift, which is up on the steering wheel, has become universal, and we, as well as the rest of the industry, have installed that method of shifting gears. Well, we used to run a lever from the transmission directly up, with a ball on the end of it, and you shifted the gears with it. But because of the engineers' creation of this change and the popularity with which it was received by the public, we have had to put this remote control on, which requires 40 parts, compared with one or two parts, and yet it doesn't function any differently than the old method did, but those parts all have to be designed, tooled, and produced, which all adds to this involved product which we are building today as compared to the early days.

INCREASE OF DECREASE OF SKILL

Dr. ANDERSON. I am interested in more elaboration of the point with respect to the upgrading of workers due to technological change. Some people have labored under the impression that once a belt-line conveyor is installed you get a semiskilled to unskilled level of worker doing almost automatic things. I can remember a Charlie Chaplin film in that respect.

Your testimony is quite the reverse; that as technological innovations increase in a large institution such as yours, the proportionate number of skilled workers in the labor force increases.

Mr. FORD. I don't think you can quite call them skilled workers, but the standards are increased, and of course you have to take into consideration the fact that all these devices and machines, the machine tools that are built and designed for this so-called technological change for greater efficiency, all require the highest type of skill manufacture those machines.

Dr. ANDERSON. Those would be the tool and die makers. What proportion are they of the total labor force?

Mr. FORD. They are about 10 percent of our total direct labor. We have perhaps 40,000 to 45,000 men on direct labor, and 4,000 to 5,000 tool makers.

Dr. ANDERSON. About 10 percent of the total, then?

Mr. FORD. Of course, they are not considered direct labor, though. But you are asking the proportion.

Mr. HINRICHS. That comes back to the same question that I was asking earlier. I would expect an increase in the skill in any particular occupational level, more skill among your semiskilled work-

ers, for example, as you improved your process, but would it be possible to indicate what has happened to the proportions of the groups of workers that you would regard as skilled workers, as opposed to semiskilled, in three quite distinct periods, say 1920, 1929, and 1939? Is the proportion of skilled today as high as it was in 1929, as high as it was in 1920?

Mr. FORD. I don't believe I could answer that, offhand. I would say that because of the refinement that goes into the product as compared with 1920, for instance, the natural tendency is for those men to all require more intelligence, or for us to require more intelligence of those men, and they have to improve their skill.

Mr. HINRICHS. I am thinking of this sort of a situation: I am very much interested in terms of the work that we are doing in the changing levels of occupational demand, and if it would be possible to make a reasonable answer, not offhand but at some later time, without giving you too much work, I would appreciate it.

Mr. FORD. We would be very glad to make a study of that.

Mr. HINRICHS. Conceivably you might have 10 out of 100 skilled workers today, and have had 15 out of 100 in 1920. The 10 might be on the average a more highly skilled group than the 15, and yet the change in that demand for skilled labor as a proportion of the total is rather significant with reference to the changing occupational pattern. If you can throw further light for us——

Mr. FORD (interposing). I would like to ask Mr. McCarroll or Mr. Moekle if they can. I don't believe I can, offhand.

Mr. MCCARROLL. When we were studying some of these questions on here, while we didn't get those detailed figures to which you refer, we had to keep in mind several things that are different in different departments, but I think it will be very easily proved by these figures that we are going to get that increase in skilled and semiskilled, and we haven't had them separated in any way. For instance, the boys coming out of the trade schools are making every year a much larger proportion of the total number of men employed, and they are certainly much more skilled than their predecessors were.

Mr. HINRICHS. A second question along the same line: again, if it can't be answered at this time, I would appreciate an answer later if it is convenient. Are these people who are coming out into the skilled jobs coming out with a highly specialized skill, or with an all-around skill? Is the proportion of those who have to have the all-around skilled training increasing, or is it becoming a very specialized type of skill?

Mr. FORD. I wouldn't think so from our experience. The men that we are making in our apprentice schools, our trade schools, are men that have a well-rounded-out experience in all types of mechanical operations.

The CHAIRMAN. Would you say, then, that the effect is not to make an automaton out of a man?

Mr. FORD. Not in our business, we feel definitely.

The CHAIRMAN. So that the experience which the man gets in a modern plant such as yours is such as to give him a well-rounded mechanical knowledge and capacity?

Mr. FORD. Yes, sir.

The CHAIRMAN. And could you switch him easily from job to job?

Mr. FORD. Very easily.

The CHAIRMAN. What type of skill is required of the individual worker in tending these machines?

Mr. FORD. Average intelligence, not any great technical experience. A machine-tool man requires a little training. They go into a department in many instances green.

The CHAIRMAN. We were discussing the skilled, and I was wondering just what type of skill is required of the worker beyond intelligence to handle the machines.

Mr. FORD. Do you mean skill based on past experience, training skill, skill from training, or education?

Dr. ANDERSON. From machinery.

Mr. FORD. Not a great deal.

The CHAIRMAN. Then what does the skilled worker do?

Mr. FORD. He is a different type. He is a toolmaker, a patternmaker, a jig and die-fixture maker.

The CHAIRMAN. And to what extent does the worker merely manipulate a machine and to what extent does he, by his own intelligence, shape the product?

Mr. FORD. The machine shapes the product. That is practically automatic. He has the intelligence to put them on, to operate the machine and not get caught in it, and that, I would say, would just require average intelligence.

Dr. ANDERSON. Let me ask, what is the training period for an assembly line worker to make him proficient?

Mr. FORD. The assembly line worker goes on the line as a green man. I am assuming that he probably would get as proficient as he ever will be inside of 30 days.

Dr. ANDERSON. In 30 days he attains maximum efficiency?

Mr. FORD. That is on plain assembly. That has nothing to do with machining parts.

Dr. ANDERSON. On machining parts, what would be the training?

Mr. FORD. You mean on an automatic machine? I should think a few days.

Dr. ANDERSON. And you wouldn't call the person working at proficiency in a few days a skilled worker?

Mr. FORD. Not a technically skilled worker; no. He is skilled at the work he is doing.

Dr. ANDERSON. But he is not classed generally as a skilled worker in the plant?

Mr. FORD. No. As we all understand skilled work, that means craftsmanship—toolmakers, patternmakers, die makers, and so on, the highest class of employee we have.

SUPPLY OF LABOR

Dr. ANDERSON. Is there any oversupply or undersupply of workers in any of the levels in which you demand workers? Can you get all the workers you need?

Mr. FORD. We can get all the common labor we need. It has been very difficult the last year or two to get toolmakers; patternmakers of the higher skills are in great demand.

Dr. ANDERSON. What is that due to?

Mr. FORD. It is due to the style change people want in a motorcar. Detroit is the center of the motorcar industry and either the sales

department or the buying public seem to want a new facial front on their automobile every year, and that requires a vast outlay for dies and tools and new fixtures every year to comply with that. We spend about \$5,000,000 a year on just style changes.

Dr. ANDERSON. Do you propose, in your trade schools, to train those very workers needed most?

Mr. FORD. Our trade school boys all come out technical workers if they are so fitted mentally. Then we have an apprentice school for employees who are older and don't go into the technical arts quite as much, who come out more of the skilled assembler, garage man, service man. He knows the motorcar, he knows the function of the internal combustion engine, but he couldn't sit down and read a blueprint and make a die or tool or fixture.

Dr. ANDERSON. Let me ask, do you see any prospect in the immediate future, knowing the market as you do, for what would be comparable to full employment in the automotive industry?

Mr. FORD. You mean by that, whether the market will increase to the point where there would be full employment?

Dr. ANDERSON. You have overcapacity at the present time, do you not?

Mr. FORD. We have; yes. I think we are running three-quarters of our capacity.

Dr. ANDERSON. Do you see any prospect in the immediate future of that thing being stepped up?

Mr. FORD. I couldn't comment on that.

Dr. ANDERSON. You are not projecting?

Mr. FORD. I really don't know.

Dr. ANDERSON. From a businessman's standpoint you are not making any decisions of your own to occupy the whole plant?

Mr. FORD. No; we are trying to build a product that will compete and be as successful as we are able to do it, and we hope that they will continually increase in volume, but there is no way of estimating that.

Mr. HINRICHs. Coming back to this question of the capacity of your different groups of workers, the assembly worker, you have indicated, is trained to full production in about 30 days. What general requirements have you in hiring such a man? You indicated average intelligence, and I suppose actually you aim at something a little better than that if you can get it.

Mr. FORD. Yes; we do. We naturally want to get the best type of employee we can.

Mr. HINRICHs. What about physical stamina?

Mr. FORD. They are all given a physical examination for their insurance and our insurance against occupational disease and that sort of thing.

Mr. HINRICHs. The average worker on the assembly line now has to work under very considerably higher tension than was true in the earlier days of motor production.

Mr. FORD. Did you say tension? I wouldn't think so.

Mr. HINRICHs. You would feel there was no greater tension now than there was in the days of essentially hand assembly?

Mr. FORD. I think parts fit together better than they did 20 years ago. My own observation in observing the line is that the men seem

to have more leisure time, take it in a more leisurely manner, and seem to know what they are doing. There is no stress that I can see.

Mr. HINRICHS. Would it be your feeling, for example, that an average man over 45 would fit on any of your assembly lines, or that a younger man would be more satisfactory?

Mr. FORD. I should think either would be satisfactory. We have a great many men that are past the age of 45 who do any work that is assigned to them.

Mr. HINRICHS. What has been happening to the average age of workers in your plant? Is your average age higher now than it was in 1929, the age of the average worker?

Mr. FORD. I believe it is. We had some figures a while ago on that.

Mr. MCCARROLL. Mr. Cameron had some figures on that which he used on the air, which showed there had been some increase.

Mr. FORD. That is my impression. I would have to verify that before I would want to make a definite answer.

Dr. ANDERSON. I wanted to refer to the question of seasonality and its effect upon production and workers. How sharp are model changes in your plant? How long a period of time does it take to make a model changeover, annually?

Mr. FORD. We usually consider approximately 2 months are involved, but that means from the time the assembly line cuts down until the new model is rolling off the assembly line. In the meantime, the only people that are involved in that shut-down are the assemblers, but they, in turn, are starting to assemble the new product long before it appears to the public before it appears in the dealers' show rooms, so that there is about a 2-months period until we start to get settled, but that doesn't mean every man is unemployed for 2 months.

Dr. ANDERSON. What do you think would be the unemployment period for the people involved in that changeover who are not permanently employed?

Mr. FORD. I should think in a normal year about 30 days.

Dr. ANDERSON. Then they spend their 11-month pay over a 12-month period of time. Is that about right?

Mr. MOEKLE. That would be about right. They would have to.

Mr. FORD. That is right.

Dr. ANDERSON. What do you find them doing in the off months?

Mr. FORD. We try to bring that period at a time when they can do some gardening and get the benefit of the summer months. That is usually from the middle of August to the middle of September, or all of August.

Dr. ANDERSON. They do stay in the vicinity of the plant?

Mr. FORD. Not necessarily. They may go off on a vacation. They may take their families off to the woods. They look forward to it.

Dr. ANDERSON. Do you find, then, in this condition, labor turnover of any substantial size as a result of a shut-down of that character?

Mr. FORD. No, sir.

Dr. ANDERSON. They come back?

Mr. FORD. Right away.

Dr. ANDERSON. Do you see any evidence at all of a halt in the movement or migration of people? I understand that the population studies show you people in the automobile area have pulled approximately 200,000 to 300,000 people from the South and Midwest to the motor area. Is there any halt in that movement of people?

Mr. FORD. I really don't know. I should think so, but I don't know.

Dr. ANDERSON. Are there more people at the gates waiting and asking for jobs, or less than we have had during the trough of the depression?

Mr. FORD. In the past 18 months there have been less, but there are still a great many looking for employment. There is still a big welfare load in Detroit.

Dr. ANDERSON. Do you think, Mr. Ford, that that problem of the unemployed is related throughout various industries? If, because of the situation of your plant in regard to size of output, efficiency of production, and cost, it does not experience an over-all technological displacement, do you think that this situation is general in industry, or that it has any bearing upon the load of unemployed in the Nation?

Mr. FORD. I would hate to comment on that, because I am so ignorant of all those facts. I know what our own industry does, but I know very little of other industries.

Dr. ANDERSON. Is your industry disturbed about the size of the unemployment population in the United States?

Mr. FORD. Yes; I think our industry is as conscious of that as any industry and are trying as hard, if not harder, to create more jobs.

The CHAIRMAN. How do you try to do that?

Mr. FORD. Create more jobs? By this so-called more highly developed product that we are producing, in design, requiring more men to produce it.

The CHAIRMAN. What could be done to cooperate with you in that effort? How could Congress, for example, help you or industry in general to create more jobs in private industry?

Mr. FORD. Well, there has been a feeling of uncertainty in the minds of a great many people which I suppose has a tendency to arrest development, to arrest purchasing. I really don't know, I am sure. It seems to me a thing that has to wear itself out.

The CHAIRMAN. You don't think there is anything that we can positively do?

Mr. FORD. I hadn't thought about it. This is a new thought to me.

DECENTRALIZATION IN FORD MOTOR CO.

The CHAIRMAN. It occurred to me that perhaps you might have been think about it because of the effort which the Ford Co. has been making toward decentralization. The paper this morning, on page 7, quoted, in response to the question "What are the effects of technological development in the one-industry town," your statement, "As some members of the committee already know, the Ford Motor Co. has 14 small plants located within a radius of 60 miles of Dearborn, in an effort to help rural communities by the decentralization of industry where possible."

Mr. FORD. Yes.

The CHAIRMAN. What was the motivation for that? What was the purpose of bringing about decentralization if possible?

Mr. FORD. We wanted originally to show an example of how a small stream could be developed hydroelectrically. We took the Rouge River and bought dam sites along the Rouge River as far as we could, depending on the flow of the river, and we put these

small plants in there. They are hydroelectric plants. The source of power comes from these generators.

The CHAIRMAN. But your purpose was to decentralize industry. Why?

Mr. FORD. That went along with it. We wanted to show how a small stream could be utilized for power output, and naturally if the power was being produced it would have to be consumed.

The CHAIRMAN. Did you think that that would create more jobs?

Mr. FORD. I don't think it created any more jobs, because we took those departments away from the main plant and put them out in the small plants.

The CHAIRMAN. How did it help the small community?

Mr. FORD. That was the best thing about it, the way it affected those small communities.

The CHAIRMAN. It struck me that it would be, and I thought you might describe it for us.

Mr. FORD. These plants are created; I know one plant has 6 or 7 men in it, but that is a very minimum. They range from 40 or 50 up to 300, and we have 1 plant where we make starters and generators, in Ypsilanti, Michigan, which is a larger town, with perhaps 1,200 people in it. When you take 1,200 people in a new industry with a minimum wage of \$6 a day, and that money is spent in that community, it revives the whole community.

The CHAIRMAN. It doesn't necessarily create more jobs, you say, but it does improve the community and the standard of living for the worker.

Mr. FORD. We didn't transfer very many of the men when we transferred this operation. We tried to employ local labor in and around those small communities. We found work for the men who had been doing that particular job in the main plant on other things. We built this small plant, the hydroelectric plant. We employed local labor, farm or semifarm labor, either men who had been working on farms by the day or farmers or small-town citizens who hadn't any great skill.

The CHAIRMAN. Your objective here was rather social improvement than the self-interest of the industry itself?

Mr. FORD. That is right. We tried to prove a point on social improvement, and to show the possibility of developing a small hydroelectric unit taking this one stream as an example; and incidentally, in every instance where we have moved these departments out there and the local men have operated them we have found that our costs have been less than in the main plant.

The CHAIRMAN. So that social improvement is a desirable thing from the point of view of industry?

Mr. FORD. Decidedly, and decentralization, I think, has a great part to play in it.

The CHAIRMAN. But you don't have any suggestions to us as to positive steps that might be taken by others to push forward this desirable ideal on which you have been working.

Mr. FORD. Well, all those suggestions are things that might create an urge on the part of other people to do the same thing. I don't know—we like to do it. But we aren't representative, necessarily, of all industry. They all have their different problems.

The CHAIRMAN. If it is to be done upon a broad scale, it must be done by the action of the entire population.

Mr. FORD. Where the most benefit would occur.

The CHAIRMAN. That is right.

I gather from your testimony, which has been most interesting, two simple facts, and I am going to ask you whether they correctly represent the picture that you have of this problem. The first is this, that without the modern machine and technological improvement it would be utterly impossible for an organization like the Ford Motor Co. to supply cars on so large a scale to so many people.

Mr. FORD. That is absolutely correct.

The CHAIRMAN. And the second is that it would be impossible for the Ford Motor Co. to use the machines which have this beneficial effect without a large-scale purchasing power upon the part of potential customers.

Mr. FORD. Yes.

The CHAIRMAN. And the conclusion to be drawn from that is that the measure of technological advance is the capacity of the masses to buy the products of technology.

Mr. FORD. Absolutely correct.

The CHAIRMAN. You agree with all those?

Mr. FORD. I agree with that decidedly.

Mr. DAVIS. Mr. Ford, your company has a number of assembly plants throughout the country, has it not?

Mr. FORD. Yes, sir.

Mr. DAVIS. Were they established solely from a transportation standpoint, or for other reasons, or both?

Mr. FORD. Well, I should say both. Originally from a transportation angle, because we have had them a great many years.

Mr. DAVIS. But you have found them beneficial from other standpoints as well?

Mr. FORD. I believe so, just the same as these small manufacturing plants have been beneficial. They, of course, are located in larger communities, but I think they have their beneficial effect in those communities. But it isn't quite the same parallel as these small plants in these very small communities, where you see the effect a great deal more.

Mr. DAVIS. In other words, your assembly plants are located in fair-sized cities, are they not?

Mr. FORD. In Louisville, Atlanta, Kansas City, Chicago—all the big cities where there are distribution centers, trading centers, so that that doesn't apply quite as effectively, although I do feel that, by giving employment in those communities at the wage scales we pay, there must be some benefit.

Mr. O'CONNELL. May I ask a question, Mr. Ford? I notice on page 7 of your statement a sentence to the effect that technological change has made possible the use of men older and with less physical strength. Converting that possibility into the realities of the situation as regards your company, does that remain merely a possibility, or is it a fact that you use more?

Mr. FORD. That is a fact. These machines are much less difficult to operate. We have devices for handling materials that enable a man of much less physical—

Mr. O'CONNELL (interposing). It would enable them, but in terms of your labor force would it be the fact that your labor force now is generally composed of older and less physically strong men than was the case 20 years ago?

Mr. FORD. They are older. I wouldn't say about less physical capability.

Mr. O'CONNELL. It occurs to me that this possibility to which you refer would, generally speaking, continue to be only a possibility.

Mr. FORD. We don't go out and try to hire older men for those particular jobs. The men are naturally getting older day by day, but we have no restrictions on age when we do hire them.

Mr. O'CONNELL. You have no general rule?

Mr. FORD. Not at all. We try to take our share of all types—crippled, blind, and incapacitated people—and work those into our industry in what we think is the proper proportion.

The CHAIRMAN. Are there any other questions?

Mr. HINRICHS. Along that same line, Mr. Ford, most of your changes in your labor force, I presume, occur during the period of rehiring after a shut-down?

Mr. FORD. After a drastic shut-down due to depression of change of model.

Mr. HINRICHS. Change of model, and a rather drastic shut-down occurs every year.

Mr. FORD. I wouldn't call those drastic shut-downs. That month is common in the industry. Everybody expects that. I mean where we are down for 3 or 4 months due to one cause or another, there is a great turn-over.

Mr. HINRICHS. But it is at those times that you make your general changes in the composition of your labor force as regards the industry.

Mr. FORD. We send out notifications to these men that have been on our pay roll, as we reemploy, and we find many of them have drifted back to their original homes, have gone into other businesses.

Mr. HINRICHS. Have you ever studied your rehiring on the basis of the age composition of the people who were laid off prior to one of those shut-downs?

Mr. FORD. No, sir; I don't think so.

Mr. HINRICHS. Would such a study be sufficiently significant from the point of view of your own management interest to warrant an analysis for the last several years of the age of the groups laid off and rehired at the opening of the new model? If so, I would be very much interested in seeing what that is on different 5-year age intervals.

Mr. FORD. We will be glad to see if we can get that information out. I am not sure; I suppose it would be available.

The CHAIRMAN. If there are no other questions, let me thank you again, Mr. Ford, for coming here and cooperating with us so efficiently. We appreciated very much your statement.

(The witnesses, Messrs. Ford, McCarroll, and Moekle, were excused.)

The CHAIRMAN. The committee will stand in recess until 2:15.

(Whereupon, at 12:35 o'clock, a recess was taken until 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:25 p. m., upon the expiration of the recess, Senator O'Mahoney presiding.

The CHAIRMAN. The committee will come to order.

Mr. ANDERSON. Mr. Chairman and members of the committee, our first witness this afternoon is Mr. Douglas F. Winnek, who will testify about a new technology and offer examples of it so the committee can ask questions pertinent to an understanding of the beginning of a great new technological product. Mr. Brackett and I went to some pains to corroborate the statements that you will hear this afternoon and to determine the fitness of witnesses that might do this sort of thing for us and we hope to bring you at least two more before the hearings are over.

We wanted to give Mr. Winnek a brief time with you in the discussion of a very revolutionary new technological change, three-dimensional photography.

TESTIMONY OF DOUGLAS F. WINNEK, NEW YORK CITY

Mr. WINNEK. Good afternoon, gentlemen. I am the reputed inventor of trivision.

The CHAIRMAN. Do you have any doubt about it?

Mr. WINNEK. Trivision is not a trade name, trivision being the name I have given to what has been heretofore known as stereoscopic photography, or three-dimensional photography; trivision being the word which to me simplifies the technical description of the process considerably. Three-dimensional photography or trivision has been sought after for a good many years, as you may or may not have known, and it started as far back as 1861 when Wheatstone and Brewster, two British scientists, thought that the supreme excellence of photography should lie in its ability to truthfully record objects as the two eyes see them, rather than as one eye alone sees them. Wheatstone developed the old familiar stereoscope that I am sure we are all familiar with, and was possibly responsible to a great extent for a very well-known photographic concern here in the country making a tremendous fortune out of the old stereograph, I think you all remember.

The CHAIRMAN. Do you contend that one eye does not take in the three dimensions?

Mr. WINNEK. Yes; I do that.

The CHAIRMAN. Is it only habit that makes me think I see the three dimensions if I close one eye?

Mr. WINNEK. As a result of considerable experimental work and research in photography, I am thoroughly convinced that 90 percent, approximately, of the perception of depth or space, or the illusion of solidity and plasticity, is due to binocular vision. About 10 percent, I should say, is the result of all of the tricks that are now being used in Hollywood, especially by Walt Disney.

The CHAIRMAN. When I close my eye I am not conscious of any loss of depth.

Mr. WINNEK. I think primarily because you have had sufficient experience with two eyes to know that there is space there. If a one-eyed man were to argue with me or debate on the subject I am sure

he would say, "I see depth, too." I think that is primarily due to experience, certainly not binocular depth. The best proof of binocular depth is to close one eye and walk down a strange stairway. I wouldn't recommend it. You will find that you will have considerable difficulty.

Another interesting thing about binocular depth is that when you hold a card, your hand, or anything solid in front of you and look at it first with one eye and then with the other you will see two distinctly different images. It is the fusion of those images in the brain in the optic thalamus that produces the rather amazing but natural result of depth or space.

Photography for generations has been, with few exceptions, completely lacking in three-dimensional relief. The stereoscope, the red and green glasses that you see once in a while in the motion-picture field, the polaroid glasses, the oscillating shutter device that was at one time quite popular in New York theaters, were all methods of producing two distinctly different retinal images; that is, the right eye and left eye were provided with two different pictures. The illusion of depth heretofore has required some visible viewing device. Trivision or third dimension by my method introduces, I believe, for the first time the three-dimensional photograph without the necessity of any visible viewing device.

The interesting thing about trivision, distinct characteristic of the method, is that we are able to take an ordinary photographic film, emboss it by momentarily softening it, putting minute microscopically small invisible beads or lenses on one surface of that film. We take any film on the market and run it through a machine which momentarily softens one side and impresses it with this lenticulated surface, as I call it, or minute beaded surface.

That surface takes the place of the stereoscope, and when you look through it, always keeping it between your eyes and the image on the emulsion or printed page or on the motion-picture screen, that surface, even though it is invisible and part of the film, performs the same function as the old stereoscope, and once again your two eyes are allowed to see two distinctly different views, and you get the illusion of depth. I could go on for quite a while talking about it. Let me show the pictures to you and probably they will do more than I can to convey the idea.

May I suggest that you hold them to the light? These are transparencies; look through them with the folder face toward you. This discovery is relatively new. It is the result of a number of years of development work starting as a hobby on my part, and since September last I have devoted my entire time to it. I have a small group of engineers helping me in Mount Vernon, N. Y. These pictures you are now viewing have been made just recently. I believe most of them are less than a month old.

DR. ANDERSON. Are these the first evidence of trivision known? Are these the first pictures that we have of this character?

MR. WINNEK. I believe they are. About a year ago we produced a few black and white experiments, but to my knowledge these are the only pictures of this type in existence. The interesting thing about trivision is that we are able, by momentarily softening the film, to impress it with this surface, then take the film and put it into any camera which you may have, the amateur camera or the professional

camera. By closing the lens down to a horizontal opening, rather than to a small peephole, as you usually do, we produce this illusion of depth. The negative with no further apparatus contains this effect.

(The vice chairman assumed the Chair.)

Dr. ANDERSON. Mr. Winnek, in your judgment what is the practical use of such a thing as this?

Mr. WINNEK. The invisible stereoscope, or, if you wish, this lenticulated or beaded screen, even though it be out of sight on all film used for commercial purposes, lends itself to use both in the taking film and in the print. Unfortunately, I am unable to show it to you at the moment, but certainly within a month we will have a photographic print paper. I only wish we could have waited to show you those. A photographic print paper that will probably serve every commercial use that ordinary glossy or semiglossy photographic paper now serves is certainly within immediate reach, and due to the character of the product will probably be used everywhere that ordinary paper is used.

TRIVISION FOR X-RAY PURPOSES

Mr. WINNEK. Similarly, we find in the laboratory as a result of considerable experimentation in X-ray, a great possibility of applying this film to X-ray work. We are making surgical X-ray pictures with them now, although they are quite crude, naturally, due to the newness of the machinery; they are very remarkable, nonetheless.

Dr. ANDERSON. What is the advantage of the trivision over X-ray?

Mr. WINNEK. The distinct advantage of the three-dimensional film or trivision film in X-ray is that it provides for the first time a three-dimensional result without the necessity of the old stereoscope.

Dr. ANDERSON. You were speaking about the value of the X-ray.

Mr. WINNEK. It is embarrassing, possibly—it certainly is to me—for the average inventor to talk about his product and claim it is the most wonderful thing in existence in the industry. I sincerely believe that trivision is probably a revolutionary product, certainly an evolutionary one, one that fulfills the demand for natural appearance of photographed objects. In X-ray this contribution probably will be more valuable than in any other field we will go into. There the physician will be able to make an instantaneous exposure on this film of the heart or the lungs.

I deliberately select a part of the body that naturally respire or in which there is normal movement. This instantaneous shot will produce for the first time on one film a three-dimensional picture of the subject, just as he would have seen had he looked into the subject with X-ray eyes.

By the slightest motion of his head, just as he would normally look at something from left to right, he will actually be able to look around the bones and beyond them. If you look at those pictures again for a moment you will notice that by moving your head to the right or left you look around the object in the foreground and see something that has been behind it.

I would like to call your attention to the picture of the lilies. One rather amazing thing about that picture is that you can hold it up against the light and take a pencil and project the pencil right down through the heart of the lily. As a matter of fact you will feel as

though you touched the lily long before you have touched the film. The picture actually projects space, and you think it is solid, even though it isn't. In X-ray that illusion of solidity, with the addition of the panoramic quality, is tremendously valuable, I am sure.

Dr. ANDERSON. Beyond the scientific use in X-ray, what would be its commercial uses?

Mr. WINNEK. Recently I gave up what has been a rather poor living as a photographic expert in New York and delved into this hobby, converting it from a hobby into a business. The first pictures that showed possibilities for commercial application, suitable for window and counter display purposes, were made last July. A large advertising display company in New York became interested in them and offered to make a market study for me.

As a result of that market study they told me that in their opinion they could keep a plant continuously busy producing pictures for display purposes, both transparent and paper, when we got the paper. Since then I have held back commercial application for the interim period for the purpose of building the production machinery capable of producing not only a transparent film but the paper as well. My thought now is to purchase film, ordinary photographic film, from every film manufacturer and to convert that film, in a plant here in this country, into third-dimension film suitable for use in ordinary cameras.

The VICE CHAIRMAN. Have you testified as to the relative cost?

Mr. WINNEK. I haven't as yet, sir. A rough estimate, and I think quite a fair estimate, would indicate that the increase in manufacturing cost, or the cost of converting that film in our plant, not the manufacturer's plant, would be about 5 percent over the ordinary manufacturing cost of that film. In the manufacturer's plant it would probably be less since the necessity of shipping the product from one place to another is eliminated. Ultimately I believe that trivision will be licensed to the manufacturers.

I think the products is of such a character that the manufacturers in the photographic film industry, possibly photographic equipment industry, and certainly in the graphic art industry, where we will reproduce these pictures by varnishing the page and embossing the varnish right on the press, should be licensed. I presume that is the simplest way to exploit most efficiently certain machinery, apparatus, and film materials that have been developed to produce third dimension under the patents.

The VICE CHAIRMAN. Can you treat a completed photograph or painting and give to it that third dimension?

Mr. WINNEK. When you take an ordinary photograph it is monocular; when you take it it is just a one-eye picture; you can put all the ridges you please on the surface of it, and it will not be converted into a three-dimensional picture. We must photograph three-dimensionally to begin with.

Mr. PIKE. You have to do it with the raw film, before exposed?

Mr. WINNEK. We do; yes.

Mr. PIKE. Would you have to?

Mr. WINNEK. I think it might be possible to take ordinary film in complicated equipment and make a series of views and combine them optically, but it would not be practical.

Mr. PIKE. Wouldn't be any sense in it?

TRIVISION IN AERIAL PHOTOGRAPHY

Mr. WINNEK. One of the most, if I may use the word, dynamic possibilities, and items of interest, at the moment to me is the application of trivision, almost immediately, to aerial photography. With the action over Norway, a great many people are war-minded, as a result of the front pages. My men and I have given considerable thought to photography from the air on this film, using slightly different aerial equipment, of objects on the ground, terrain, topography, camouflaged trenches, gun pits, and buildings of that sort. The normal camouflage would not be of much value here.

We would build up on one film the three-dimensional picture. An interesting feature of the trivision film in aerial photography and in X-ray is that for the first time we are able to calibrate the film itself.

The VICE CHAIRMAN. Able to do what?

Mr. WINNEK. Calibrate the film.

The VICE CHAIRMAN. What happens to it when you do that to it?

Mr. WINNEK. We can put a faint ruling on the film with a scale at each edge of the film. When the picture has been made, simply by holding it to the light and wiggling it back and forth there is a relative displacement of images on that film. The movement of the images is in direct proportion to the third dimension and can be read directly on the scale. The aerial photographer can go up in the air above the gun range and with an infrared filter and telephoto lens can photograph objects in safety on the ground. The picture will have the same magnification and the same depth as the objects on the ground, and all the dimensions can be easily and accurately measured on the film.

Similarly, the X-ray film being calibrated will offer the physician a very accurate way of diagnosing exact distances.

The VICE CHAIRMAN. You mean you can measure accurately the distance between objects by a picture?

Mr. WINNEK. Yes, sir; you do so simply by looking at the film; the slightest motion of your head, once you have focused your eye or eyes on any one point of focus, will reveal a displacement of images on all other planes. That is, the further away an object is from the point of focus the greater the motion of the images on that plane.

The VICE CHAIRMAN. What I mean is, Can you measure in feet or miles?

Mr. WINNEK. Yes. By calibrating the aerial film, we would be able to read directly and instantaneously the exact number of meters, miles, or feet. The unit of calibration you might want to put on there will determine the answer.

The VICE CHAIRMAN. You mean you have something on the film that measures the distance between objects?

Mr. WINNEK. Yes, sir; that is right; it will be especially valuable in X-ray and I am sure very valuable in aerial photography.

Mr. PIKE. Like putting latitude and longitude lines on a map?

Mr. WINNEK. Somewhat similar. I don't know whether or not I am using the proper technical language—cross-hatch lines with the scale at the top and bottom. One feature of trivision is that it will probably apply to motion pictures. I have tried to identify myself for a number of years now, even though it has been a hobby until recently,

as being the one inventor in the photographic industry with a third-dimension idea who didn't expect to revolutionize motion pictures overnight.

I pay tribute to all the other inventors; a great many of them, I think, sincerely believe they have the answer to the third-dimensional motion picture.

The VICE CHAIRMAN. How many patents, have you testified, do you have on this thing?

Mr. WINNEK. I believe I have as many as 5 patent applications in Washington and as many as 200 others on their way in. Commissioner Coe and Mr. Brackett invited me down in what certainly are the early stages of development.

The VICE CHAIRMAN. Two hundred applications for patents on this matter you are talking about?

Mr. WINNEK. We have as a result of considerable work in the past few years developed over 200 patentable developments suitable for application as the finances justify it in this field. I believe that the distinct feature, the interesting thing about trivision is that it is the beginning of a new industry, not a series of gadgets. We have developed new X-ray camera equipment, new X-ray tubes, a new aerial camera, new rangefinders, all utilizing the principles of trivision. Certainly an amateur will be able to buy this film very shortly, I presume between now and the fall, and put it in his camera or one of our cameras, which we will probably sell. These cameras will give additional depth.

You will be able to take the film back to the drug store, and 48 hours later, after we have processed it in our plant, get back third-dimensional pictures.

The VICE CHAIRMAN. How many patents have you on making the picture distinguished from the mechanism through which you display it?

Mr. WINNEK. Of the material we have been developing, I would say that probably 200 of the disclosures, a little less, are necessarily mechanical ideas. I would say that out of the 200 disclosures we have extracted or are extracting no more than 6 basic or fundamental ideas, methods of, and apparatus for—mostly methods of. The stronghold, at the moment, from a patent viewpoint lies in our ability to do something that men have tried to do and haven't done before successfully, namely, putting these little invisible beads on the plastic film or on the plastic resinous coating of the print paper, so that they are optically accurate and permanent in character.

The ridged material is not new as an idea.

The VICE CHAIRMAN. What is not new?

Mr. WINNEK. The idea of putting ridges on a film for the purpose of producing a stereographic result, third dimension, or color. Dr. Herbert Ivez—

The VICE CHAIRMAN (interposing). When you say the idea of putting those ridges on so as to create the third dimension—what other word did you use there?

Mr. WINNEK. I am sorry, I don't know myself.

The VICE CHAIRMAN. The idea of making pictures stand out.

Mr. WINNEK. The idea of putting a ridged screen or a grating between the eyes of an observer and the photographic plate for the purpose of producing color or depth is not entirely new. I think the

distinct contribution here is the reduction of that idea to practice in almost every field of photography.

Dr. ANDERSON. Mr. Winnek, when you speak of creating new industry, are you thinking in terms of an absolutely new industry? Is there nothing in the field? How much of a displacement of other industries will this thing cause?

Mr. WINNEK. I have given considerable thought to displacement of labor and machinery, or possible replacement, if you wish, by the process, or due to the process. I think that shortly the public will demand third-dimensional pictures because they will see some and expect them. I think that trivision, or the process displayed here, will undoubtedly permit the conversion of existing equipment very quickly to eliminate flat photography and produce third-dimensional photography. I think the market will demand it almost as fast as we can produce. I don't foresee a displacement of labor.

I do feel that the activity of the industry will increase considerably, certainly during the novelty period, which can exist for quite some time, and in the graphic art industry where textbook illustrations will no doubt sooner or later be printed in third-dimension. I think there will be new jobs, but to what extent I can't say.

Dr. ANDERSON. Once having gotten over the main hump of inventing a thing of this kind, what confronts you as an inventor, businessman, in carrying on to a practical industry?

PROBLEMS OF FINANCING DEVELOPMENT

Mr. WINNEK. I would like to reduce it to inventor in the first place. For the last few years as a result of having been very active as a more or less engineer—I have no college degree and consequently I presume I don't qualify as an engineer—I have specialized in photography and for a number of years have been very active in jobbing out my time and that of my men in developing photographic equipment and methods. In September I seriously decided to give up that business and go into this as a business, and since then I have definitely sought the proper financing, because money is necessary to carry on and convert from this laboratory exhibition stage into a producing stage.

Fortunately I met a display company official who immediately grasped the opportunities. I have no connections other than moral with them or with anybody else, as yet. I have from time to time met and discussed with businessmen the thought of their putting money into the thing. Long before I decided to go into this thing as a business I did explore the possibility of getting finance back of it. I found that the first thing the businessman thinks of, I presume quite justifiably, when you go to him with an idea, is just what merit has it, just what patent protection can we get or have you got? As a businessman he is naturally subconsciously, or consciously, thinking of a trading position, and to justify any finance put into it. Unfortunately it has been my experience that the more revolutionary an idea is the more difficult it is to get the original finance. The more revolutionary an idea the more patent expense, more patent development cost, you are confronted with; the more gamble there would be on the part of investors and the more difficult it is to interest that investor.

I have met with continuous failure for a number of years now. I, for a while, was considerably ashamed of it; I thought I didn't know how to promote it, or the product wasn't any good. Recently I gave up seeking money or discussing finance and for almost a month and a half now the young men and myself in the laboratory have resorted to making gadgets and selling them. We have a photographic exposure pencil, for example, and little nonsensical gadgets that certainly are not utilitarian in quality, just novelties. We find that those seem to sell very quickly and from the revenue derived we hope to keep ourselves living comfortably and get this product on the market.

DR. ANDERSON. Let us look at this matter of capitalizing a new and revolutionary enterprise such as this that you say would likely result in a whole new industry. We have heard a great deal of risked capital and the venturesomeness of promoting businessmen. You have had some experience in that connection, haven't you?

MR. WINNEK. Yes; a little.

DR. ANDERSON. What does it sum up to? You say you haven't been able to raise the capital in that way. Have you had people who were willing to go in with you on some terms?

MR. WINNEK. Naturally the first thing that enters into the mind of anyone in the photographic industry, looking at this picture or these pictures, is, "Well, I should imagine the boys in Rochester or Binghamton or New Jersey, the film manufacturers, would just love to get hold of that" and I sincerely believe as a result of many friendly and helpful contacts with them that they are all interested in the development, more or less. I think that the attitude of the businessman in that industry is, "Well, when you get something, when you have successfully demonstrated there is a market, there will be time enough." It is pretty revolutionary; there is an awful gamble attached to it.

MR. PIKE. You will get a much bigger price for it then?

MR. WINNEK. Possibly. One thought has impressed me tremendously from time to time, about the advisability of different means of marketing, to do justice to the process, looking at it from both a selfish and a business viewpoint—I mean my selfish viewpoint, not that business is necessarily selfish—I think the greatest revenue could be derived by licensing all of the film manufacturers, rather than to go under the wing of one exclusively, or attempting to do business with one alone. The contacts with the three manufacturers I have mentioned indicate that any one of them would be more than glad to help, provided there was some exclusiveness attached to it.

I think that by purchasing the film and the product of these manufacturers and converting it ourselves and reselling it we would more or less keep their good will and hope, in due time, to build up a position that would merit and justify licensing relations with all. I think there is money available for developments of this character. There are two ways of getting it: one is to give a stock promoter a set of pictures to put in his pocket—and I am sure that the enthusiasm displayed to me by a few of my friends who are in that business indicates that they would like and are ready to go out and raise money through the novelty value of the product.

I think the other way would be to offer a manufacturer the exclusive sales of the product. My natural desire is to refrain from

granting any exclusive rights. I think that a great deal more can be accomplished and developed without that exclusiveness.

Mr. PIKE. That is why you are going to take all of the film first and then process it? Establish the attractiveness of it in the market and then you think they will all come running?

Mr. WINNEK. Well, not exactly, but very close to it, I believe, once we have demonstrated there is a market and are selling their film. If the film is all I really believe it is, the public will demand it, and the manufacturers will have to have it.

Mr. PIKE. One more question. I would like to ask—I think you have covered it, but I am not clear. So far you are using the coat-chrome, or something similar, just for transparencies?

Mr. WINNEK. We are using an ordinary color film, simply running it through the machines and taking our pictures.

Mr. PIKE. Now, when you come to putting it on a print, must the picture have been taken on that sort of film? I mean, when you really get so you can make the print with your process on the gelatine, or whatever it is.

Mr. WINNEK. The prepared photographic paper might be used in the camera, but undoubtedly a negative made on prepared film would be necessary first.

Mr. PIKE. When you finally get so you can make a print of it, must the print be done from this prepared film in both cases?

Mr. WINNEK. Yes; or from a prepared film. Referring once more very briefly to the technical end of it, the ridged surface on the negative resolves the picture into a depth picture when you look at it. The ridged surface on the projection screen, on the X-ray film, on the print paper, or on the magazine page (in that case the resinous coating is embossed with a warm roller almost simultaneously with the print) serves as the viewing device.

Mr. PIKE. About what is the size of the little cross hatches?

Mr. WINNEK. On the present film I believe about 200 to an inch; on the commercial film that we propose to release almost immediately, one way or another, we will have certainly no less than 300. The object is to get the ridges so small that you don't see them.

Mr. PIKE. Same as a half-tone or something of that sort?

Dr. ANDERSON. Mr. Chairman, we have promised Mr. Thomas, the next witness, we would get him out of here this afternoon and if there are no other questions of Mr. Winnek (we wanted to give you a glimpse of a new technological development in the making), and we will proceed with our next witness.

Mr. WINNEK. Thank you.

The VICE CHAIRMAN. Thank you very much, sir.

Dr. ANDERSON. Mr. Chairman and members of the committee, Mr. R. J. Thomas, the—

The VICE CHAIRMAN. We haven't been swearing the witness. We used to do it but found it didn't do any good.

Dr. ANDERSON. Mr. R. J. Thomas, president of the United Automobile Workers. Is such he is in daily contact with the industry which we have been discussing for the last 2 days. He is to present a statement to the committee and is available for questioning at this time.

STATEMENT OF R. J. THOMAS, PRESIDENT, UNITED AUTOMOBILE WORKERS, DETROIT, MICH.

MR. THOMAS. Gentlemen, I would like to say that I think I am pretty much qualified to discuss this problem for the automobile industry, due to the fact that I have only been out of the automobile shops for the past 3 years. I spent over 15 years working in the automobile shops and actually have personal knowledge and know what happens in the automobile plants.

More than any other industry the auto industry has been credited with stimulating and promoting the prosperity of the 1920's. Basing its expansion upon the accumulation of wealth in the country through American primacy in post-war years in the world's economic and industrial life, the auto industry set the pace of national prosperity.

The value of its product increased from \$30,000,000 in 1904 to \$3,000,000,000 in 1919, and over \$5,000,000,000 in 1929. Employing directly 12,000 workers in 1904, the auto industry gave jobs to 343,000 in 1909 and 447,000 in 1929 (Census of Manufactures). By 1929 the auto industry, according to claims of the Automobile Chamber of Commerce, provided either directly or indirectly for the employment of over 4,000,000 Americans.

This tremendous expansion in production and employment was linked up with an even more striking accumulation of profits. From 1919 to 1929 profits of major automotive companies had averaged year by year 21 percent of their net worth. And net worth had risen steadily from \$606,000,000 in 1919 to over \$1,500,000,000 in 1929.

At least 100,000 men and women found employment directly in the auto industry during these years who would otherwise have found no gainful occupation. For the most part these new workers required to turn out a constantly expanding automobile production came from the agricultural regions of the South and the Midwest. Distress in the farm belt, together with the displacement of farm labor by improved technology, was providing the auto makers with a generous reserve supply of labor. Between 1920 and 1930 over 200,000 native whites of native parentage migrated to the State of Michigan, drawn by the magnet of jobs in the auto shops (C. W. Thornwhaite, *Internal Migration in the United States*, p. 20). These people had seen the advertisements of employment in the papers of Georgia, Alabama, Tennessee, or Mississippi. They found economic salvation (for the time being at least) by migrating to such cities as Detroit, Flint, and Toledo. Their new purchasing power helped prop up our economy against the underlying threat of economic crisis. Expanding auto production in those years gave the Joads of that time a chance for employment and a decent life.

While expansion of the auto industry was providing jobs for hundreds of thousands of Americans, another and contrary process was going on within the industry itself—the increasing displacement of labor by technological progress.

During the 20's this process was almost always relative, not absolute, in its effects. While the total demand for labor to produce at a given level was being constantly reduced, an equally constant rise in the level of production increased the over-all demand for labor.

The clearest picture of these tendencies is given in a recent study by the National Research Project of W. P. A. On the basis of the National Research Project figures it can be estimated that man-hour productivity in the auto industry rose from 100 in 1919 to 234 in 1929. In other words, a group of auto workers able to produce 100 cars in 1919, were able to produce with the same labor time in 1929 a total of 234 cars.

But in spite of this increased man-hour productivity the National Research Project figures show total employment increasing by 30 percent from 1919 to 1929. Now this increase in employment was brought about despite increasing man-hour productivity, as is made plain by the rise in production between 1919 and 1929—from 100 to 312.

So long as the buying power of the public was sufficient to allow this explosive growth of production, total displacement from the industry was no immediate menace to the auto worker. This mass production was the keynote to the prosperity and efficiency of the auto industry.

Compare the development of the auto industry with that of the 59 industries studied by the National Research Project. From 1919 to 1929 auto production rose 212 percent; in the 59 industries it rose 44.9 percent. Employment in the auto industry rose by 30 percent; in the 59 industries by 1.6 percent. In productivity the auto industry rose 134 percent while the 59 industries could squeeze out an increase of only 43.2 percent.

Since the automobile industry is included among the totals for the 59 listed above, the 1.6 percent increase in total employment between 1919 and 1929 may be attributed to this one industry. Only a phenomenal increase in auto production kept the country from an overall decrease in its employment in this period.

CHANGES IN PRODUCTIVITY SINCE 1928

Mr. THOMAS. As was noted before, the tendency of improved machinery to displace labor in the auto industry during the 1920's was balanced out by a consistent expansion of production. But when the purchasing power, which had allowed this expansion, slumped disastrously in 1929 and the the years following, the story was a very different one. Accumulated relative displacement of labor became, in those years, absolute. Had something close to the 1919 level of productivity been maintained, even the low level of production from 1930 to 1934 would have insured an employment of nearly twice the actual employment. But with advanced technology, employment sank lower and lower until in 1932 and 1933 only 54 percent of 1929's labor force was employed.

Nor did the coming of the depression check the trend toward ever-increasing man-hour productivity. By 1935 man-hour productivity stood at 112 percent of 1929; by 1936, at 116 percent; and, according to recent figures worked out by the National Research Project, at 117 percent in 1938. This is the over-all picture proved by the most reliable and accurate studies that have been made in the industry.

That the displacement of necessary labor for a given level of production in the auto industry has taken place, is beyond question. However, the Automobile Manufacturers Association, in a recent

study by Andrew T. Court (*Men, Methods, and Machines*, 1939), expressed a different point of view. Says Mr. Court:

During 1937 employment in automobile factories averaged 15 percent higher than in 1929 although production lagged 10 percent below 1929 levels.

Mr. Court concludes:

There has been no aggregate technological displacement of labor in automobile factories despite the introduction of countless new and more productive machines and processes.

In making this cheery estimate Mr. Court has neglected to take into consideration two or three factors of primary importance:

First, Mr. Court's figure for employment in 1929 is taken from the Census of Manufactures. His figure for 1937 is estimated from the indexes of the Bureau of Labor Statistics. Unfortunately for Mr. Court's thesis, the Bureau of Labor Statistics figures are not necessarily comparable with Census of Manufactures statistics. Economists generally estimate that the Bureau of Labor Statistics partial survey of the industry indicates employment figures for the entire industry about 15 percent higher than they are in actuality. The Bureau of Labor Statistics figures are, therefore, constantly revised downward to coincide with more complete statistics from the Census of Manufactures. For 1937 the Census of Manufactures lists 479,341 wage earners in the motor vehicle, motor vehicle bodies, and parts industries. Mr. Court estimates for the same year, from the Bureau of Labor Statistics, an employment of 517,000. Exactly why this economist should choose the unrevised Bureau of Labor Statistics figure is a question toward which I can offer no solution. At any rate, comparing employment between 1929 and 1937, using in both cases the Census of Manufactures as the source, it appears that employment rose from 447,448 in 1929 to 479,341 in 1937. In other words, instead of Mr. Court's 15 percent rise in total employment, we have a rise of only 7.1 percent.

Mr. HINRICHS. Mr. Thomas, I don't want to stop you at this point, but I would like, for the sake of the record, to comment on that, later. Please continue your testimony now.

Mr. THOMAS. Secondly, Mr. Court neglects to take into consideration the shortening of hours per week which has taken place throughout the automobile industry as a result of collective bargaining. Average hours per week in 1929, according to the National Industrial Conference Board, were 46.8. In 1937, according to Bureau of Labor Statistics, average hours in the industry per week were 35.8 hours.

This single factor, which Mr. Court does not consider worthy of reference, is more than enough to explain a 7 percent rise in the total number of men employed in the industry.

What is essential, however, in determining total labor displacement, is not the total number of men whose names may be on the pay rolls of auto companies, but the actual number of man-hours worked at a given level of production. On this basis, according to the National Research Project figures in 1937, 92 percent of 1929 production was obtained, with 82.1 percent of 1929's man-hours. This figure is clear evidence of the actual labor displacement which has occurred.

To get a fuller realization of what these statistics mean it is necessary to estimate the total employment at 1929 hours per week, which would have been available in 1937. Assuming, then, that the average

auto worker had worked 46.8 hours a week in 1937, only 366,000 men could have been employed in the industry to obtain 92 percent of 1929's production. With shorter hours per week, 479,341 were actually employed. This means that in 1937, 112,000 jobs, at least, were saved by the union's battle against long hours.

It may be noted also that wages for this increased group of workers were larger in 1937 than in 1929. Total wages paid in 1937 were \$756,000,000; in 1929, \$733,000,000. These facts suggest very strongly that unionism in the auto industry has not only protected the auto worker against the menace of technological unemployment; in addition, the stability and general welfare of our economy as a whole have been supported. One hundred thousand auto workers can provide the life blood for a city of upwards of 1,000,000 inhabitants. That this city was not wiped out by the force of technological change can be explained only by the growth of collective bargaining as supported by the National Labor Relations Board and other progressive Government agencies.

WAGES AND TECHNOLOGY

Mr. THOMAS. It has been claimed by various representatives of automobile manufacturers that the relatively high wages paid in the industry have been made possible by "technological progress." Said Mr. Sloan, of General Motors:

In the automobile industry improved methods resulting in constantly increasing efficiency have made possible wage rates well above the level of industry in general.

Our friend, Mr. Court, has similar opinions. He says:

The gains from technological advances show in many ways. Weekly earnings of factory workers in the industry have averaged 24.3 percent above the comparable average for all manufacturing industries for the past 10 years.

It will be granted without question that wage rates in the automobile industry are somewhat higher than those paid throughout industry in general. To explain this differential on the basis of the industry's improved technology is a highly questionable procedure. Far more relevant to the issue are two facts:

First, competition for workers in the industry. From the earliest days of automobile manufacturing up to the mid-twenties, expanding production required an expanding labor force. This labor force could be supplied only if automobile employment were made sufficiently attractive to recruit new workers. Workers in the automobile industry in the old days, moreover, were of comparatively high skill. Carpenters, cabinet makers, sheet-metal workers, blacksmiths, and others would move into the industry only if the bait of high wages were offered. As a result of this, during the twenties the automobile industry was among the higher-paying industries of the country. So anxious were automobile manufacturers to overcome this relative shortage of labor that their advertisements continued to appear in Southern newspapers and their employment agents continued to be active even after a more than adequate labor force in Michigan and other automobile centers had been built up. After 1929, needless to say, competition among auto manufacturers for workers languished considerably. With hundreds of anxious applicants for every job, high wages were no longer necessary. Thus the

depression, with its millions of unemployed workers, drove wages down precipitously after 1929. The average hourly wage rates were 75 cents in 1928, 62.8 cents in 1932, and 59.9 cents in 1933.

It should be noted, of course, that in the years 1928 to 1933 as wage rates were being pushed down technological progress was moving forward rapidly. Although man-hour productivity in 1931 and 1932 apparently fell, this is explained by the decreased efficiency of a low production level. Correlation between technological progress and higher wage rates is to be found in the minds of apologists for the industry and not in its statistical records.

Secondly, union influence on wages. It would seem exceedingly difficult to prove that the rise in wages from 59.9 in 1933 to 92.2 in 1938 and 92.8 in 1939 can be accounted for by technological progress. Much more relevant to the issue would seem to be the union's policy of demanding higher wage rates. Auto workers are now organized to bargain collectively for better wages. Employers are no longer able to beat down wages by playing one employee against another.

Further evidence toward this conclusion is seen in the fact that a considerable differential in hourly wage rates exists between organized and unorganized automobile plants. For instance, the Chrysler Corporation is paying at the present time an average hourly rate of 97 cents. The Ford Motor Co., protected from organization by various agencies, pays an average hourly rate of about 87 cents. Automobile workers doubt very much that Mr. Ford would pay even this rate were it not for his desire to forestall organization.

The experience of 1937 and 1938 is final proof for our thesis that high wages are to be credited to union organization rather than technological advance. The latter part of 1937 and all of 1938 were depression years. Auto production and employment slumped to 1932 and 1933 levels (1938 production, 51.8; employment, 63.3; man-hours, 44.2).

But wage rates did not slump accordingly, as in earlier depression years. Instead they rose from 88.5 cents in 1937 to 92.2 in 1938 and 92.8 in 1939. Again it was demonstrated that only when union organization is strong may workers secure any share of the benefits of technological progress.

General Motors has and continues to earn more money for its owners than any manufacturing corporation in the history of the world. Although its total assets as of December 31, 1937, totaling \$1,566,000,000 were slightly exceeded by a few other corporations, yet its average yearly earnings in the 29 years of its corporate existence have exceeded those of all other corporations.

So reports the Federal Trade Commission in a recent study of the automobile industry.

Even for the 11-year period, 1927-37, the Federal Trade Commission finds G. M. profits averaged 35.5 percent of total investment in manufacturing. This average was made in spite of depression conditions.

For the same years the Chrysler Corporation made an annual average return on total investment in the auto industry of 27.27 percent.

These truly remarkable figures on profits suggest very strongly who the principal beneficiaries of increased productivity in the industry have been.

To make any reliable estimate of the benefits of technological advance to the car owner during recent years is impossible. It is clear that the modern automobile is the product of a whole series of improvements. Competitive conditions existing in the industry have forced manufacturers to improve the quality and the appearance of automobiles with a fair degree of consistency.

Whether the progressive elimination of competition in the industry would have the effect of checking improvement in the product is a question on which we have been unable to obtain any reliable information.

The experience of the Ford Motor Co. since the change over in 1927-28 has not encouraged other manufacturers to make any basic changes in over-all methods of production. In this connection a recent statement by one W. J. Cameron, of the Ford Motor Co., is interesting. Mr. Cameron said in his Sunday Evening Hour of March 3, 1940, in reference to the Federal Trade Commission report:

The report shows that the cost of making a Ford car is higher and profit in selling it is lower than for others in the low-price field. Why this higher cost of making and this lower profit in selling? Is it due to wasteful expensive Ford manufacturing methods? On the contrary, everyone adopts them. Or does it indicate that more quality is built into Ford cars? Some members of our organization complain that too much quality is built into Ford cars. It takes too many years to wear them out.

I want it understood that I am quoting Mr. Cameron, not myself.

The VICE CHAIRMAN. What do we get out of this advertising anyhow?

Mr. THOMAS. Those familiar with the auto industry will recognize, of course, that the low-profit margin on Ford cars is not to be explained on the basis of super value created in the car. Rather it is to be explained on the basis of high overhead costs per car which follow inevitably upon a level of production lower by far than capacity.

(Senator O'Mahoney resumed the chair.)

Mr. THOMAS. The Federal Trade Commission report (p. 672) indicates that in the years since 1927 Ford's average annual rate of return on the total investment during the entire 11-year period was 0.04 percent. This means simply that because of low sales high overhead costs per car wiped out the anticipated profit margin.

In 1929 the Ford Motor Co. ran somewhere close to capacity production, turning out over 1,600,000 vehicles. In 1932 and 1933 the Ford Motor Co. turned out a little over 300,000 vehicles. Even in 1937 the Ford Motor Co. turned out only 900,000 vehicles. Place over against this the total productive capacity of the company—in the neighborhood of 1,800,000 vehicles—and the high overhead cost per unit is evident.

These figures on Ford production in relation to productive capacity will serve to explain the \$91,000,000 profit made by Ford in 1929 as well as the \$74,000,000 loss marked up by the Ford Motor Co. in 1932. Mr. Cameron's effort to explain these losses as evidence of his company's generosity is not very happy. This incident serves to illustrate as well the fact that heavy investments in new machinery sometimes serve to defeat their own purpose; that is, the reduction of costs. Without seeking to analyze this subject in detail, it is apparent that heavy investments in new machinery are profitable when a steady mass market is assured.

When operations proceed at near capacity, then the tremendous saving in labor costs is sufficient to wipe out investment in machinery and return lush profits. But when operations are at a low level, capital expenses refuse to be laid off, speeded up, or technologically displaced. They continue exacting their heavy toll in unit costs per car. To counteract this tendency the employer naturally seeks to reduce labor costs still lower, though in this case primarily through the intensification of labor itself. This is one of the keys to the tremendous development of raw speed-up in the industry after 1929.

Other manufacturers have preferred to keep their plants up-to-date by a series of small yearly changes. This appears to be Ford's method now.

Mr. Court claims that these yearly change-overs in automobile models have restricted the rate of technological displacement in the industry. He says, "Thus the prospect of model change delays or eliminates entirely the use of many labor-saving machines." Mr. Court apparently had not read the report of the General Motors Corporation for 1938. Stating its policy on model change-overs, G. M. announced that its purpose is—

To inject into each new series of products * * * features which promote comfort and convenience and add to greater appeal from the standpoint of appearance * * * (so that) the time during which the original purchaser operates any one car is reduced and there is a flow of relatively up-to-date cars into the used-car market. * * * The rapid evolution of design necessitates a more rapid turn-over of productive equipment * * * with resulting benefit to costs, because advancing technology is always producing more efficient instruments of production.

In other words, the corporation believes the change-over in models with its necessary season of slack production is desirable in that it gives the company an opportunity to introduce labor-saving improvements in machinery and technique.

Most auto workers believe that these labor-saving improvements in machinery bulk much larger than do actual improvements in cars produced.

The VICE CHAIRMAN. Would you like to stop for a moment there? What is the statement you just concluded?

Mr. THOMAS. "Most auto workers believe that these labor-saving improvements in machinery bulk much larger than do actual improvements in cars produced."

The VICE CHAIRMAN. What do you mean by that? I don't quite get that.

Mr. THOMAS. In recent years there hasn't been very much change, mechanically, in an automobile. I have met many manufacturers who tell me quite frankly that the reason they change models annually is not because they are producing a better car but so they will have a better sales field, something different. It is like keeping up with the Joneses. They change the model so the man doesn't want to drive last year's model.

The VICE CHAIRMAN. What I didn't get is quite the connection between the proportion of new devices to the new feature of cars.

Mr. THOMAS. What I am trying to say is that the technological improvement in the industry, the change in machinery, is very much greater than the change in the automobile would warrant.

The VICE CHAIRMAN. You mean, then, that these technological changes are for the purpose of increasing the productivity of the individual?

Mr. THOMAS. That's right.

The VICE CHAIRMAN. That is what you mean?

The CHAIRMAN. But Mr. Ford made the statement this morning that there are about 16,000 parts in the 1939 model as compared with about 5,000 parts in the 1926 model.

Mr. THOMAS. I don't doubt that statement at all. That is probably true. There are many more parts in the average automobile today than there were a number of years ago, but following that theory, does that mean that in 10 years from now there are going to be 32,000 parts in the automobile? That change from 5,000 to 16,000 parts was done through a few years there, when the technological improvement in the automobile itself was greater. For the past several years there hasn't been that improvement.

The CHAIRMAN. His testimony was that in 1926 they had 5,000 parts; in 1929, 6,000 parts; in 1939, 16,000 parts, so that in the past 10 years there has been quite a change in the inherent quality of the car and not alone in its style or fashion.

Mr. THOMAS. That is correct. But as I say, in the last 2 or 3 years that hasn't been the case at all.

The CHAIRMAN. You are telling us that the change in the machinery in the last 5 or 10 years has not been very great?

The VICE CHAIRMAN. Just the opposite, is what he says. He says the change in machinery has been great, but the change in machinery has been out of proportion to the change in the automobiles.

Mr. THOMAS. That is right.

The CHAIRMAN. I see.

The VICE CHAIRMAN. And the point seems to be that this change in machinery is to increase the production of the individual working man.

Dr. ANDERSON. Beyond that, isn't it to increase the salability of the product?

Mr. THOMAS. That's right.

The VICE CHAIRMAN. How about that? That seems to me to get at cross purposes on that.

Mr. THOMAS. No; you might increase the sale of an automobile without improving anything mechanical about it at all. If you have noticed, they put a bulge in here, leave a running board off there, and just by changing the looks of the car they make the car salable.

The VICE CHAIRMAN. What I am trying to get at is the substance of the point you make, that the new devices are increased out of proportion to the improvement of the car. Do you mean by "improvement" the improvement in the wearability of the car or the looks of the car, or is it the new devices to increase the number of cars which a given group of employees can produce?

Mr. THOMAS. The improvement has come about—well, I have had a manufacturer, or several manufacturers, say to me, for instance, on some certain skilled trade—of course, I disagree with what Mr. Ford said on that this morning, because I have had manufacturers say this to me—that they are developing new technological processes. When I go in and ask for a wage raise for a certain skilled trade, they

say, "Well, if you get that wage rate too high we will put a machine in to do the job which can do it cheaper."

The VICE CHAIRMAN. There is something to that, too, isn't there.

Mr. THOMAS. Certainly; that is what has happened. The automobile manufacturer has only put in technological improvement to reduce wages.

The CHAIRMAN. To reduce cost.

Mr. THOMAS. That is right. Well, that is wages.

The CHAIRMAN. It is a very important element in the cost, probably the most important.

Mr. THOMAS. That is right.

The VICE CHAIRMAN. Now, have you ever figured out, with regard to any more improvement for increasing productivity, how much you would have had to reduce wages to keep human beings doing what these important machines have done?

Mr. THOMAS. I can't answer that question.

The VICE CHAIRMAN. Has anybody ever gone into that at all?

Mr. THOMAS. I haven't. I heard Mr. Ford ask that question this morning. He told about what the car of years ago would cost if it were sold today.

The CHAIRMAN. There was testimony, of course, this morning, that wages would have to be reduced to a perfectly ridiculous level, if you could hire enough persons to produce the same number of cars at the same cost.

Mr. THOMAS. I agree with that.

The CHAIRMAN. That is perfectly obvious. There is no dispute about that.

Mr. THOMAS. That is right.

EFFECT OF THE "SPEED-UP"

Mr. HINRICHS. While you have been interrupted, Mr. Thomas, you used the phrase "gross speed-up." What do you mean by that?

Mr. THOMAS. Well, for instance, today, or the other day, a man walked into my office. This man happened to work for the Ford Motor Co. He was a very good friend of mine. He is a younger man than I am—considerably. He was a metal finisher in the plant and, by the way, is not a union member. He walked in and sat down and talked to me about a half hour, and then he stood up. This man is in a perfectly healthy condition, but when he stood, because of the way he had to work in the plant, he fell down on his knees, because he had been used to being in that position so much that he couldn't stand up after sitting down like that for a short while.

The CHAIRMAN. Do you mean that that is characteristic? You give us a single instance. Do you want us to understand that that is characteristic of all workers?

Mr. THOMAS. No; I wouldn't want to do that. I want it understood that there are a lot of workers in that same condition.

The CHAIRMAN. You are contending that the speed of work which is required is too great for many men to stand.

Mr. THOMAS. That is right. I myself, working in the automobile industry—of course in the organized plants we try to overcome that to a great extent—over a period of years, when I was a much younger man than I am now, have worked, well, there was no limit to the

hours, and when we worked, I suppose most of the time the average was a 9-hour day. I would say that was about the average, and when I went home from work I sat down and tried to read a newspaper but I was so tired I couldn't do it. I would immediately go to sleep, or my hands would be so sore, maybe, from working on a job that I couldn't open them after I got up out of bed in the morning. I would say that 5 years ago in the automobile industry that was generally true.

The CHAIRMAN. But it is not true now?

Mr. THOMAS. Not generally in the industry. It is quite generally true in the unorganized part of the industry.

The CHAIRMAN. You attribute that change to organization?

Mr. THOMAS. Yes; I do.

I have a number of cases here of statements that men have made to me who work at the Ford Motor Co. I wonder if I could read them. It will take only a few minutes.

The CHAIRMAN. Surely.

Mr. THOMAS. First, these are each different men whom I have spoken to at the Ford Motor Co. The names of these workers I don't want to give out; it should be quite obvious to everybody why I don't want their names in the record. I am quoting what the men say:

The foreman says "Step on it." So much has to be out a day. Production is raised every day. If behind, I have to work faster.

A second man says:

When we start working on these frames our foreman and his two bosses threaten us worse than slaves. Not even a chance to blow my nose.

A third:

The threat of being fired or laid off; boss and foreman standing behind the men's backs.

A fourth man:

He (speaking of the foreman) would tell the men "Either get them out or go home." Why can't they handle the working men like human beings?

A fifth:

Whip-cracking, browbeating, bulldozing, a tyrannical and autocratic attitude is assumed and maintained at all times by all officials from foremen up. No improvement is too extensive or complicated as long as it tends to speed up production, but practically no improvement is ever considered concerning the comfort or wellbeing of the workmen. We have no relief to get to the toilet; no attention is paid to ventilation and temperatures. Toilets, coat rooms, and exits are over-crowded. We sit on the floor to eat lunch. The floor is oily and full of ruts which are full of water and oil. Hell!

That from a worker employed 16 years by the Ford Motor Co.

Representative SUMNERS. Do you think that is, from your observation and experience, a correct picture of the conditions in the plant?

Mr. THOMAS. I have talked to hundreds of men from the Ford Motor Co., and I can go right down the line, and that is the picture I get from them. I have been at the gates of the Ford plant. It so happens that I was there once and Ford put me in jail, but I have been out at the gates of the plant and any reasonable person who would go and watch the Ford men coming out of work and then go to the gates of any other automobile plant, I don't care what com-

pany it is, could see the difference in the spirit of the men coming out from work.

Dr. ANDERSON. Let us look at the assembly line of two of these different firms. What marks the difference in the speed-up of the Ford assembly line over any of the other motor groups?

Mr. THOMAS. Well, as I said, 5 years ago there probably was very little difference. Of course, originally Ford was the originator of the conveyor lines. That was one of the biggest technological improvements in the automobile industry, and Ford was the originator of that. Up to about 5 years ago men would start to work on those lines and as they got broken into the job the foreman at the end of the line would turn a crank to make the line go faster; and he would just keep turning that crank, making the line go faster and faster each day. Finally, the men with the least resistance or the men who were a little grayhaired, or maybe physically weaker than the others, found it impossible to stay on the line, so they were replaced by, well, better athletes, I would say.

Mr. HINRICHS. But daily increase in speed at the beginning of a season is a necessary part of the process of getting a new model under way, isn't it? That is not the thing you are complaining of.

Mr. THOMAS. We are talking about two different things. I agree that what you are talking about has to be done. The thing I was talking about continued throughout the year.

Mr. HINRICHS. And the union now concerns itself with this question of the amount of effort required?

Mr. THOMAS. The union concedes that a man, or especially a group of men working on an assembly line, when they first start on a job, are not at their top efficiency to do an honest day's work until after about 30 days, I would say; but after that, after they reach a certain speed, then we claim, in our organization—well, in some companies we negotiate joint standards with the companies, but, after that, if a man protests the speed at which he has to work, we have the right in all our contracts to take that up with the management as a grievance, and they are pretty generally settled by negotiations throughout the industry.

Mr. HINRICHS. Which of the companies are negotiating joint standards?

Mr. THOMAS. The companies that are negotiating joint standards are, most of them, small companies. I believe the Briggs Manufacturing Co., a body company, is one of the biggest companies that is doing that.

Mr. HINRICHS. From the union point of view, are you finding conditions in those plants more satisfactory?

Mr. THOMAS. Oh, yes; considerably so. I might say that I was in with one manufacturer the other day—I hate to state the names of manufacturers because it might give some of them a bad reputation, and we are getting along well with them now—and he said:

I am glad we got the union in here. We used to be known all over the city as a butcher shop, and today we have good labor relations, and we want to keep that.

Dr. KREPS. Coming back to the subject of technology, maybe I am anticipating something you are going to deal with, but I have been wondering whether technological change in the industry can be meas-

ured in terms of displaced workers. You seemed, as I looked at it, not to separate the amount of work that is done, such as the figures that you just gave on man-hours, from the amount of employment that you think does not exist because of technological displacement as such. Now, as I say, maybe you have some measurements further down the line in which you allow for seasonal and cyclical changes and for other types of unemployment besides technological unemployment. Is that correct?

Mr. THOMAS. Yes.

Dr. KREPS. Maybe you would like to go on with your statement, then.

Mr. THOMAS. I think this has to do with the question you ask right here: Speed-up in the automobile industry.

1. INTENSIFIED LABOR (SPEED-UP)

Speed-up in the automobile industry is a controversial subject. Certain authorities explain that there is no such thing. The unanimous testimony of 400,000 auto workers stands definitely and unanimously against that conclusion. They have experienced the terrific speed-up of the modern auto shops.

The N. R. A.'s study of the automobile industry issued early in 1935 points out:

The automobile industry throughout its history has always been efficient and became more efficient through the decade of the 1920's. At the end of this decade it had reached a peak of practical efficiency; that is, efficiency that takes into account human capabilities from an effective and industrial engineering standpoint. The industry led the country in effective time study of its operations and the time-study men gradually brought its operations to this efficient peak.

I might say, in speaking of this time study, I have been time studied on a job. By the way, because the workers in the automobile plant had been speeded up so much, there was a tendency on their part, when a man came around to time study them, to try to cheat on that time study if they possibly could, and I might say I was the same as every automobile worker. One day I was being timed on a spot-welding job, and I tried to get as good a time as I could on the job, and I was given my time on that particular job the next morning. I went to work on the job and I tried my best to get out the number of pieces I had been timed for the day before, and it was impossible to do.

A lot of workers at the plants say that to me today, and a lot of times I have thought, well, maybe they just don't want to do so much. Yet I know what my own experience was, that it was just impossible for me to make the time study which they had made upon me.

The CHAIRMAN. You were glad enough to make that record while you were being timed.

Mr. THOMAS. But I didn't make that record.

The CHAIRMAN. When you were being timed you made a record, as I understood you.

Mr. THOMAS. No the fact of the matter is, I tried to slow down.

The CHAIRMAN. While you were being timed?

Mr. THOMAS. While I was being timed, and the next day I couldn't keep up with that time.

The CHAIRMAN. But slow down time—

Mr. THOMAS (interposing). The point I am trying to make, this time study that they talk about doesn't mean a thing because they set men with stop watches to take the employee's time, and it used to be the system in the automobile industry that the man in charge of the time-study department got a cut on added efficiency every time he could cut time and get the men to do so much more work. The result was, instead of taking honest time, they would look and see what your record was last year, and maybe boost a little more for the last model.

Mr. PIKE. You both were playing tricks, and he won.

The VICE CHAIRMAN. You mean the next day you couldn't go as slow as you went the first day?

Mr. THOMAS. The next day I couldn't go as fast as what the company claimed I had gone the day before, but I actually knew I hadn't gone that fast.

In other words, before the depression even began automobile production was carried on with every scientific method for squeezing a maximum quantity of work per hour from the individual worker. Jobs were broken down and timed to the fraction of a second. Men were offered bonuses to exceed the production on the rates established by time study men. When these levels had been surpassed the new attainments were accepted as normal, and intense pressure was applied for higher and higher records of output. With the coming of the depression the universal testimony of the auto workers is that speed-up increased beyond the powers of human endurance.

Quoting again from the N. R. A. report of 1935:

The only reason that it (speed-up) can exist as at present is because of the huge available supply of labor through which as one man falls by the wayside, another is there to take his place.

"If you don't like this job there are thousands outside the gate who do." That was management's stock reply to every grievance and admonition to everyone who fell behind the frantic pace of the assembly line.

Hounded by foremen, supervisors, and time study men, workers "turned out production" with no regard to standards of health or safety. Miserable as job conditions may have been, they were less miserable than the chronic disaster of an auto worker's life—unemployment. Although the N. R. A. brought a slight upward revision of wage rates, those gains according to the testimony of thousands of auto workers were nullified by the exactions of this increasing speed-up.

Summing up workers' testimony on this development during 1933 and 1934, the N. R. A. report states:

Everywhere workers indicated that they were being forced to work harder and harder to put out more products in the same amount of time, and with less workers doing the job. There was a tendency to excuse the automobile manufacturers for lack of steady work. "That is caused by market conditions." But when it comes to increasing their work loads they are vigorous in denouncing the management as slave drivers and worse. If there is any one cause for a conflagration in the automobile industry, it is this one.

It would be untrue to say that since the organization of the U. A. W. speed-up has been absolutely eliminated from the automobile industry. Auto workers are producing even yet on levels above those of most industrial workers in this country. But the more vicious features of the speed-up system have been eliminated in the

organized plants at least. Workers are no longer subject to dismissal at the whim of a foreman or company spy. Unfair production standards are negotiated with management and in most cases eased down. The vicious piece-work system has been eliminated from many plants. "Slave driving" has been replaced by collective bargaining, and an industrial dictatorship has given away to the recognition of human rights.

Only in the unorganized plants does the speed-up system still prevail.

SPEED-UP AND OLDER WORKER

Before the coming of the union, few men over 40 could be found on assembly lines or basic production jobs in automobile plants. Most operations had been simplified and specialized until they required no experienced skill for satisfactory production. It is alleged that in the Ford plant 43 percent of the workers require 1 day to learn their jobs, 36 percent up to 8 days, 6 percent up to 2 weeks, 14 percent from a month to a year, and only 1 percent more than a year.

Mr. PIKE. What is the basis of that? Have you any idea who made that statement?

Mr. THOMAS. We have—whether Ford recognizes it or not—a local union in the Ford plant, and this is from our people who belong to our union in the Ford plant.

Mr. PIKE. That is, workers in the plant believe that is about true.

Mr. THOMAS. Yes.

The VICE CHAIRMAN. Is the difference in the time to learn how to do that work, due to the difference in the ability of the individual to learn or the difference in the difficulty of the work to be done?

Mr. THOMAS. It might be both. This means that experience and skill are relatively minor assets in a modern auto plant. Instead the ability to endure incredible demands upon nerve and muscle are wanted—not patient craftsmanship.

Some of these older workers find places on the few skilled jobs remaining in the auto plants. Others are relegated to sweeping floors or running elevators. But the vast majority are simply laid off and allowed to shift for themselves.

Says the N. R. A. report:

The most tragic situation in the industry was revealed to us through the testimony of the older workers. They had service records of 10, 15, 20, 30, years, often in one plant and occasionally in one department of a plant. Always their story was the same. After many years' service with less layoff than anybody else there came a time (often in the early years of the depression) when they began to be laid off early and were taken back only during the busiest season of the year. That happened for several years and then finally they did not get back at all. Seldom if ever were they told that they were too old. They were merely told that when there was something for them they would be called back. But they were never called back.

Protection for the worker over 40 through a seniority program has been one of the central objectives of the union. The U. A. W.-C. I. O. is proud that it has saved thousands of older workers from unemployment and a hopeless dependence on charity at the prime of life. However, an adequate social-security program alone will provide salvation for that group of older men who are unable to meet the still rigorous demands of automobile production.

To deny that this problem of the older worker exists is irresponsible folly. Mr. Court claims that—

The automobile industry increased the proportion of men 45 years or over between 1920 and 1930 by 9 percent, according to the U.S. Census. The normal expectation, considering this rate of growth of the industry during this period and using the performance of other industries as a criterion, was for a decrease of 7.1 percent in the proportion of these older men.

The CHAIRMAN. Mr. Thomas, have you made any computation of the ages of your members?

Mr. THOMAS. No.

The CHAIRMAN. How many members are there in your organization now?

Mr. THOMAS. We have contracts covering some 400,000. There is something I would like to explain at this point. In the automobile industry as a whole there are peaks and valleys. When a new production season starts usually their employment goes up to the peak. There are thousands of automobile workers in the industry who only get 2 or 3 months' work out of a year.

The CHAIRMAN. How many persons?

Mr. THOMAS. I said thousands—I imagine, guessing—I was going to take a guess. I would say 15 or 20 percent of the automobile workers don't get over 3 months' work out of the year, and I don't know that those figures are anywhere near correct. I am just guessing by my own experience.

Dr. ANDERSON. Will you explain that, please? Why is that?

Mr. THOMAS. When they bring out a new model, and as the old model goes down, salesmen and dealers try to get all their current models off the showroom floors as quickly as possible. When they start in production on a new model, they try to have their dealers' stocks built up to a great height, have their dealers filled up full of cars before they announce a new model, which means that there is a tremendous amount of work during those 2 or 3 months. After those dealers are supplied, then they usually go below normal for about, I would say, 8 or 9 months, and then there are about 3 months in the industry, as a general rule, in which only the various oldest workers in the industry work at all.

Dr. ANDERSON. You are coming to such seasonality in a moment, I know, but according to the testimony of Mr. Ford this morning with respect to seasonality, there is a lay-off of a month for a small proportion of the total force.

Mr. THOMAS. Of course, as I heard Mr. Ford this morning, I think what he said there is at least 75 percent wrong. I happen to know from experience at the Ford Motor Co.—I have been working around or watching that plant for a long time—there are great peaks and valleys where thousands of men are called in and thousands, after a short time, are laid off who are never brought back to work.

Dr. ANDERSON. So the idea of an 11-month working year, even for those who are not hardest hit by the yearly model changes, would not, according to your observation, be correct?

Mr. THOMAS. That is right. Anyone coming to Detroit wouldn't have to look very far to find, even at peak seasons, thousands of automobile workers on the streets, on W. P. A., and every place else.

Dr. ANDERSON. Do you have any figures in your union respecting seasonality in the plants in which your union works?

Mr. THOMAS. We have.

Mr. J. H. WISHART (director of research, U. A. W.-C. I. O., Detroit, Mich.). We have a statement on that in 1934.

Dr. ANDERSON. Would it be possible, without too much trouble, for your able statistical staff to compile figures on seasonality of workers as you know them?

Mr. WISHART. I think that can be done.

The CHAIRMAN. You have not compiled statistics on the average age of your members?

Mr. THOMAS. We have a comparatively young membership.

The CHAIRMAN. That would be a pretty good indication, would it not, of the age of automobile workers, the average age of your members? That would just about tell the story, wouldn't it?

Mr. THOMAS. That is right.

The CHAIRMAN. Don't you think it might be a good thing for you to do that? You could probably do it without a great deal of difficulty.

Mr. THOMAS. I think so. According to a Brookings Institution report, in 1938-39, 7.2 percent are less than 25 years old; from 25 to 29, 16.6 percent; 30 to 34, 18.8 percent; 35 to 39, 17.6 percent; 40 to 44, 14.8 percent; 45 to 49, 11.8 percent; 50 to 54, 7.4 percent.

The CHAIRMAN. That is about equal to the first group you mentioned, isn't it?

Mr. THOMAS. Yes. From 55 to 59, 3.5 percent; 60 and over, 2.3 percent.

The CHAIRMAN. What is the authority for those figures?

Mr. THOMAS. That is written by William Herndon McPherson, *Labor Relations in the Automobile Industry*. This is compiled for the Manufacturers' Association.

The CHAIRMAN. Does he state, on the page from which you read, the source of his figures?

Mr. THOMAS (reading):

Estimated by the Automobile Manufacturers' Association, based on a 10 percent sample of employees of member firms.

The CHAIRMAN. Do you have any reason to believe that that is inaccurate?

Mr. THOMAS. I just don't know.

The CHAIRMAN. You would assume that it is fairly accurate?

Mr. THOMAS. It is fairly accurate, I think. Ford, of course, doesn't belong to the Automobile Manufacturers' Association.

Dr. ANDERSON. Mr. Thomas, figures of that kind, standing by themselves, haven't very much comparative value. I presume you treated of the topic of older and younger workers in your paper.

Mr. THOMAS. Yes; I have already mentioned as I went through here that we are having absolutely no difficulty in the organized plants today. In every contract we have, we have seniority provisions, and we are having no difficulty at all with aged workers.

The CHAIRMAN. What are those provisions?

Mr. THOMAS. It is occupational seniority, and a man can't bump another man off his job, regardless of how old he is.

The CHAIRMAN. Just on account of age, regardless of how old he gets?

Mr. THOMAS. That is right. We protect his job, no matter how old

The CHAIRMAN. Suppose his productivity falls off?

MR. THOMAS. In an automobile company there is always a place where a man can be used no matter how old he is. For instance, in the Chrysler Corporation they have one department of old men; in the Dodge plant in Detroit there are men there who are working who are extremely old. I went through there the other day. One man was formerly a superintendent of a plant, some 76 years old now, who is working on a bench there. It happens that at this time he belongs to the union. He had a grievance and we took up the grievance for him. They call it the old men's department, and they have work there which they are capable of doing.

EFFECT OF SHORTENED HOURS ON PRODUCTIVITY

THE CHAIRMAN. In the earlier days of the labor movement it was, I think, pretty well demonstrated that shortening the hours of labor tended to increase the productivity of the worker.

MR. THOMAS. That is right.

THE CHAIRMAN. When instead of working 10 or 12 hours a day the worker was required to labor only 8 hours a day, he did a better job for his employer and he was a better citizen, too, because his health was better. That is correct, is it not?

MR. THOMAS. I wouldn't say that he had done a better job. The average automobile manufacturer—when you are working in there, it is pretty hard for an employee to do a better or worse job.

THE CHAIRMAN. I wasn't talking about the automobile manufacturer in presenting that question. I was talking about the history of the labor movement.

MR. THOMAS. That is true; yes.

THE CHAIRMAN. That was true, was it not? Now then, what is your impression of the result upon productivity of these activities of the union which you are describing?

MR. THOMAS. Well, I don't think there is any question that we have less productivity, because we have lessened the speed-up.

THE CHAIRMAN. But you feel that you compensate for that in the condition of the worker, is that correct?

MR. THOMAS. That is right.

THE CHAIRMAN. How much have you lessened productivity?

MR. THOMAS. I would doubt very much that it would be over (in the industry as a whole) 5 or 10 percent. Ten percent would be a large figure, in my estimation.

THE CHAIRMAN. That productivity, thus reduced 5 or 10 percent, compares with the productivity of 5 or 7 years ago in what way?

MR. THOMAS. I think there is a big fatigue factor. When men worked 10 or 12 hours a day there was a big fatigue factor, and when they went to 8 hours a day, many manufacturers got out the same production—and this is not taking technological improvements into account at all. The Ford Motor Co. especially was able to get out the same amount of production in 8 hours that they had formerly done in longer hours. In the organized plants, I don't think we have cut productivity any, in comparison with the hourly productivity of a 12-hour day, for instance.

THE CHAIRMAN. In other words, the elimination of the fatigue factor does not decrease productivity.

MR. THOMAS. That is right.

The CHAIRMAN. What is it that has decreased productivity?

Mr. THOMAS. Well, the organization.

The CHAIRMAN. I mean what requirement of the organization—what practice that you now require?

Mr. THOMAS. If a member of ours is working on a job and he feels so fatigued that he can't keep up with that job any longer, he places a grievance.

The CHAIRMAN. It is the elimination of the speed-up, then.

Mr. THOMAS. That is right. It is the elimination of the extreme speed-up. There are still speed-ups, but it is extreme speed-up.

The CHAIRMAN. Speed-up of such a character that it becomes a grievance which can be presented to the proper committee and argued out.

Mr. THOMAS. That is right.

The CHAIRMAN. So that the elimination of the fatigue factor of itself does not decrease productivity, but the elimination of excessive speed-up does.

Mr. THOMAS. That is right; yes.

Mr. HINRICHS. As a matter of practice, have most of those grievances risen in connection with standards that have already been in practice, or have they originated when the speed has been further increased?

Mr. THOMAS. We have very few. We have some, but the proportion is very small on jobs, as you say, that have been standard. We pretty much generally go along with that.

Mr. HINRICHS. When you say that productivity has been decreased, do you mean that you had restrained the increase in productivity, held back the increase?

Mr. THOMAS. That is right.

Mr. HINRICHS. Rather than actually decreased productivity?

Mr. THOMAS. That is right. Another thing, when I say that, of course, there are many times violent disagreements between us and the management on where there is a speed-up or a slow-down. We go into production on a new model, for instance. The management has figures from a previous year of what amount of work they were able to produce, but they have made what they consider is a technological improvement. Our workers find that it is not a technological improvement in many cases; it is a hindrance, so that actually they are able to do less work after the improvement is made than before.

I ran across that in several instances in the last year. The management put fewer spot welds on the floor board of a car, which is all steel now, than they had the year previously; so they said, "You ought to be able to do more of them," but when we went in to negotiate on the thing we found that even though they were putting fewer welds on, the ones that were left were in more awkward places, so it actually took more time.

Dr. ANDERSON. Mr. Thomas, has the union ever attempted to restrict introduction of new technological processes?

Mr. THOMAS. No.

Dr. ANDERSON. You accept the introduction, and then attempt to control their use?

Mr. THOMAS. That's right. Well, I don't know; you say "control their use." We often get accused of that. When I go out into a

plant I tell every member of our union that I want him to give management a fair day's work. Now, a fair day's work is a hard thing to measure, sometimes. I mean, I don't want any of our people standing around, I want them to work steady, but I don't want them to be like race horses, either.

Dr. ANDERSON. But the union is conscious now, as perhaps it hasn't been in the past, that there is a technological-productivity increase, and are you attempting to reach any understanding with the management about it? You say the slow-down is part of that. Are there other ways that you attempt to control production?

Mr. THOMAS. I still don't admit that there has been any slow-down. I say we have gone to normal. There has been no slow-down. We have tried to stop the management's speed-up rather than have a slow-down. In our opinion we don't try, in any way, to hinder technological improvements. In fact, we go along with what perhaps Mr. Ford would say, in that we agree with technological improvements, but what we ask for is that the savings made with those technological improvements should be shared to a greater extent with the workers.

Dr. ANDERSON. Is that why you referred a few moments ago to the large net earnings on capital? Do you infer that that is an improper situation?

Mr. THOMAS. Yes; I do.

Dr. ANDERSON. What, in your judgment, should be the prevailing situation?

Mr. THOMAS. I don't think Mr. Ford's money should get any bigger return than what I get on mine.

Mr. PIKE. It doesn't, by the record.

Mr. THOMAS. We will say General Motors, or Chrysler.

PLANT INVESTMENT AND PRODUCTIVITY

Mr. PIKE. There is a point there, I think, that perhaps might be made that was perhaps missed. You said that Ford's low earnings are very largely due to the fact that he has a very large plant not very much used. Isn't it true that both General Motors and Chrysler, also, have substantial plant capacity not used to its peak?

Mr. THOMAS. Not to such a large extent as Ford, because Chrysler's and General Motors' production has increased more rapidly in the last few years than Ford's has.

Mr. PIKE. There is also another point, Mr. Thomas, that in the automotive industry there is a very high speed of production as compared with plant investment, where you can say \$1,000,000,000 of investment can produce \$3,000,000,000 of automobile, or so. So the importance of plant investment to output isn't anywhere near as great as it would be in many other lines where you have, say, only \$1 of output per dollar of investment, or as in the public utilities, where you have \$1 of output for \$6 of investment. The burden of fixed interest charges, whether paid by the public or whether paid to the bondholder, as in Mr. Ford's case paid to himself as a shareholder, is nowhere near as great on the production.

Mr. THOMAS. That is correct.

Mr. PIKE. So it is pretty difficult for me to see that any great proportion of the difference in earnings can be due to the differences in the plant.

Mr. THOMAS. There is another factor that enters into Mr. Ford's case. I am not sure of the figure, I believe I could say honestly that Mr. Ford has thousands of service men on his pay roll who put nothing into the automobile at all. They are just there; well, in the union we call them "good squads."

Mr. PIKE. I have heard the expression. I never knew it meant service men.

Mr. THOMAS. When you put thousands of service men on your pay roll who have nothing else to do but to go out and watch other workers to see that they don't whisper to each other and that they don't talk and that they keep away from other departments, you are bound to have a high overhead.

Again I must accuse Mr. Court of not hitting the nail right on the head. According to the Census of Occupations, 17.4 percent of auto employees were 45 or over in 1920. In 1930, 19.1 were 45 or over. This is an increase in proportion of 9.8 percent. In all manufacturing and machine industries 26.2 percent were 45 or over in 1920 and 29.5 percent in 1930. This is not a 7.1 percent drop in proportion, as claimed, but a 12.2 percent increase. Even by 1930, then, before the weeding-out process had become most ruthless, more than 1½ times as many (proportionately) workers 45 years of age or older were employed in all industries as in the auto industry?

DISPLACEMENT OF MEN BY MACHINES

Mr. THOMAS. It is impossible at the present time to give any full or adequate survey of changes which have been taking place in machinery, techniques, and methods of production generally throughout the industry. With tens of thousands of operations involved, this subject is one which requires a special analysis by a group of trained engineers and economists provided with specific facts on production costs. We intend, rather, to give certain examples of changes which will indicate general tendencies and illustrate the techniques involved. Obviously, the examples will not by themselves prove that there has been an over-all displacement of labor in the industry. Representatives of the manufacturers may well cite changes in machinery and products for the improvement of automobiles which have tended to increase the necessary manpower in automobile production. That there has been over-all displacement of labor is proved not by these examples but by the general statistics regarding production and man-hours of employment which we have already cited.

Approaching this question of technological change generally, it can be said that the tendencies pointed out in 1935 by the N. R. A. report summarize most of the present developments in the industry. Since 1935 there have been few, if any, basic changes in the method of manufacture or machinery. Rather there has been a continuation of incessant small changes which individually may have had no considerable effect, but which in the aggregate have served to intensify tremendously total labor displacement.

1. The N. R. A. report, for instance, lists the introduction of a photoelectric automatic inspection device used in the inspection of wrist pins. This inspection robot was introduced in one of the departments of the River Rouge Plant of the Ford Motor Co. in 1935.

It resulted in the displacement of 8 out of 10 workers previously employed on the inspection job.

The robot proved so satisfactory on wrist-pin inspection that a similar machine was designed for application in the camshaft section of the same department. On that job now 4 men are doing the work formerly done by 18.

Mr. PIKE. Do they do as good a job?

Mr. THOMAS. A better job.

With this background of success, another robot was designed along similar lines to inspect crankshafts weighing 75 pounds each instead of 18 pounds for each camshaft. When this machine is finally introduced it is expected that 2 men will be able to do the work formerly done by 90 on this job.

2. The most striking example cited by the N. R. A. report of technological advance was the labor saving achieved through the introduction of the all-steel automobile body. According to estimates made in the report the all-steel body was turned out at a cost of \$30 less per unit. This was done in spite of heavy costs for steel and new equipment.

Since 1935 no such revolutionary change has taken place in automobile body making. Rather, there has been the development of more satisfactory and efficient machinery reducing the number of stampings necessary for a body and turning out a product requiring much less time for finishing and repair.

The CHAIRMAN. I presume that you have no objection to the machine, have you?

Mr. THOMAS. No.

The CHAIRMAN. Because the statement is frequently made that anybody who presumes to discuss this question of technology and its effect upon the human element is necessarily an enemy of the machine. But I gather from your testimony here that you and your organization recognize that the machine has made a most invaluable contribution to society.

Mr. THOMAS. That is right.

The CHAIRMAN. And you are not in any sense, in discussing the desirability of better human application, desiring to displace the machine?

Mr. THOMAS. No; we don't want to do that.

The CHAIRMAN. I thought it would be well to bring that out.

Mr. THOMAS. In this phase of the industry the development of strip mills in the steel industry has had considerable effect. Sheets are now received from the steel mills made exactly to size for the stamping out of car bodies. This has eliminated the jobs of scores of shearmen who previously were required to trim steel sheets to size.

In painting bodies, considerable changes have been realized within the last few years. In one medium-sized plant the substitution of synthetic enamel for Duco paint has reduced the number of coats from 2 to 1, eliminating sanding operations altogether and dividing the number of paint operations in half. This change resulted in the displacement of 250 men in 1 department that I know of. I might also add that the manufacturers always say when they make an improvement like this, "It is better for the customer." But you look at any automobile that was painted 3 years ago, and it is a perfectly

smooth job. Look at any cheaper automobile today (the higher-priced automobiles still use Duco), in any automobile in the cheaper price class, you will find what is called by the manufacturer an "orange peel" finish. It is very wavy if you look at it very closely, and it is not nearly the smooth glossy finish that the automobile of 2 or 3 years ago had on it.

The CHAIRMAN. To what do you attribute that?

Mr. THOMAS. Before Duco they put many coats on, and they did a lot of hand polishing on it to bring out a high luster. With the paint they have today they don't need to do that. The luster comes out without any rubbing whatsoever, but any spray-painting job leaves that orange-peel effect. It is not perfectly smooth and it doesn't have any rubbing done on it at all.

The CHAIRMAN. But it is just as durable.

Mr. THOMAS. It is just as durable. It may be more durable.

The CHAIRMAN. And the appearance is as good?

Mr. THOMAS. The appearance is not as good.

The CHAIRMAN. Except for this orange-peel appearance. That is the only defect?

Mr. THOMAS. That is right. Any automobile manufacturer himself will admit that.

The CHAIRMAN. And it is a cheaper finish, is it?

Mr. THOMAS. Oh, much cheaper, because they do away with over half the employees in putting it on.

The introduction on this same job of an automatic paint sprayer, in place of the dip method formerly used has eliminated approximately 90 men. This is in another department.

3. Constant changes are taking place in the thousands of machines used for turning out the various mechanical parts going into the construction of an automobile. The types of changes here might be listed under three main items:

(a) Increase in the operations performed by a single machine. For instance, in many plants where previously 4 or 5 stamping presses were necessary, a multiple press has been introduced. Dies are now constructed so that the whole series of stamping operations may be done on one machine.

(b) Speed-up of the machine through improved cutting tools. The use of diamonds or carbide tips speeded up many drills, cutters, milling machines, broaches, lathes, and other machines.

(c) The simplification in operation of machine has made it possible in many cases for a single operator to increase the number of machines he can run.

(d) The introduction of conveyors in handling bodies, parts, engine blocks, and so forth, has gone on consistently throughout the industry.

In one plant, for instance, a conveyor system was installed for the making of car cushions. Where before a single worker did the complete assembly, now on the conveyor line workers are assigned to one small part in the whole assembly job. This has resulted in an increase of 200 percent in production. Steadily during the past years the efficiency of conveyors has been increased and their use extended over wider and wider sections of the industry.

The CHAIRMAN. Then I would take it as a result of the conditions you are now describing, there would necessarily be a displacement of

labor unless the market for the increased product which the new process is capable of putting out were increased proportionately.

Mr. THOMAS. That is right.

Dr. ANDERSON. Just to add one more question to that, is it your contention that the reason why we do not see the absolute technological displacement effected in the automotive industry is that very fact of still meeting an expanding or large market demand?

Mr. THOMAS. No; the automobile industry is not at the moment expanding.

Dr. ANDERSON. I said "an expanding or large market demand." You can take your choice.

Mr. THOMAS. I think Mr. Ford was right in one statement he made. It was along this line, that if they only put 5,000 parts into a car there probably would be another half of the auto workers who wouldn't be working today, because of technological improvements. But the fact that there are many more parts is the only reason they have been able to stabilize the thing as much as they have.

Mr. HINRICHs. I think you also mentioned the reduction of hours as being a very important factor.

Mr. THOMAS. That is another factor; yes.

PRODUCTION AND EMPLOYMENT SINCE 1929

The CHAIRMAN. But the output of the automobile industry is not expanding now, is that your statement?

Mr. THOMAS. Yes. I think I read a report in the newspaper last night by one expert who claimed that last month there were as many automobiles built as in any other time in history with the exception of 1929, and it was very close to the figure of 1929, yet there were many more people working in the industry in 1929 than there are today.

The CHAIRMAN. Have you definite figures to show that?

Mr. THOMAS. I haven't definite figures, only from what I know in my own experience in the industry.

The CHAIRMAN. Is there any statistical basis for that statement?

Mr. THOMAS. I think there is. What I base my estimate on is that practically every plant in the automobile industry is employing fewer people today.

The CHAIRMAN. That is a very important statement, if I understand you correctly. If 10 years ago the production of automobiles was practically the same as it was last month, and the production last month was accomplished by fewer workers, that would be a very significant statistical fact.

Mr. THOMAS. I think that could be very easily proved.

Mr. HINRICHs. You meant, didn't you, Mr. Thomas, that it was accomplished with fewer man-hours. Did you also mean a smaller total number of people on the pay roll?

Mr. THOMAS. Yes.

The CHAIRMAN. Will you look into that and furnish us a statement?

Dr. ANDERSON. Mr. Chairman, Mr. Thomas has, in his last table of his document, a table showing the story through 1936. Do you have it built up beyond '36 to '38?

Mr. WISHART. We have it for '37 and '38 here.

Dr. ANDERSON. It will settle the question immediately.

Mr. WISHART. If I may be allowed to read the figures, production in 1937 was 92; employment, 107.1.

The CHAIRMAN. Now you are talking in terms of indexes.

Mr. WISHART. That is right, and we are taking 1929 as 100. In other words, in 1937 there were 7.1 percent more workers who had employment for a part of the year than there were in 1929; in 1938 employment was 63.3, with production at 51.8. Naturally the figure is higher for this year. My guess is that total employment, the total number of workers whose names were on pay rolls in 1939 was perhaps a trifle under 1929.

The CHAIRMAN. And what about the output?

Mr. WISHART. The production index for 1939 hasn't been worked out yet on this basis, so there is not much that can be said. Production will be lower than it was in 1929.

The CHAIRMAN. Well, of course, then there is no comparison. The statement as you made it is not borne out by these figures.

Mr. THOMAS. But proportionately I say what I said is true.

The CHAIRMAN. That is still your analysis of the statistics?

Mr. THOMAS. Yes; that is my best estimate.

The CHAIRMAN. All these economists make a lot of estimates, you know.

Dr. KREPS. You certainly agree that the man-hours are much lower. Whether or not the number that were reported on pay rolls was lower is another question.

Mr. THOMAS. I think the names on pay rolls are less.

The CHAIRMAN. I think it would be a very important fact to develop if it is a fact.

Dr. ANDERSON. Is it possible for you to get such data?

Mr. THOMAS. I think it is; yes.

Dr. ANDERSON. Will you supply it to the committee?

Mr. WISHART. We hope to provide that.

Mr. THOMAS. I might say, in talking about these changes, I had another experience with technological improvement myself in an automobile plant. I happen to be a welder. I have done the plant's gas and electric arc welding. I got a job in the Cadillac Motor Car Co., and was welding rear-axle housings by hand, and they paid \$1 apiece for welding those rear-axle housings. Their production averaged about 100 per day, which required, obviously, 10 welders. We did 10 housings apiece a day, which we were paid \$10 for doing. There was an engineer who worked for the company, and I worked with him quite a lot—a Mr. Goodspeed was his name—who developed the Goodspeed automatic head for welding. That machine would turn out more than enough in a day, with one man operating it, for the day's production, and the wages were less than the \$10 which each one of us originally received.

The CHAIRMAN. That machine was capable of turning out more than 100 welded housings?

Mr. THOMAS. Which formerly the 10 men had turned out. I was quite interested in the analysis Mr. Ford made, arguing that the cost of these machines offset the number of people laid off. I can take an average mechanic and take this Goodspeed head. Of course, it was worth something to the man who invented the thing, but it is such a simple affair, and they use only one in a plant, that if any

decent mechanic at all couldn't build one in two weeks' time I would think he was a pretty poor mechanic.

Mr. HINRICHS. What happened to you 10 men? Were you given other jobs in the Cadillac plant?

Mr. THOMAS. The 10 of us were given other jobs, yes, but we were given less skilled jobs; that is, most of them were. I continued welding there for several years, but most of those 10 men were given less skilled jobs. Their wages were cut. Some of them, of course, left, because they thought they had opportunities of finding a job for their trade some place else.

Here are a few more examples of changes along the lines suggested above which have taken place recently in the automobile industry. In the production of moldings, graining was formerly done by hand. This operation was replaced by an automatic graining machine which has increased output per man by 400 percent.

On a press used in the manufacture of clutch release bearing springs an air valve was installed, operated by foot, thus enabling the operator to increase production by 90 percent.

On the operation of division channel fabrication in an automotive hardware plant a drill press was moved closer to the operator, and the table lowered. On this job production was increased from 542 per hour in 1938 to 794 in 1939.

The introduction of an automatic polishing machine used for the finishing of many parts and accessories occurred in one automobile parts plant in 1938. Before a man had been polishing stock on individual grinding wheels. With the introduction of the polishing machine, production per hour for each man on one typical part increased from 100 to 500.

Automatic machines were installed in 1938 in many plants for the milling, reaming, and boring of many cylinder blocks. Previously this operation had required six machines; now the whole job is done by one operator on one machine. The job of the operator is to feed housings to the machine and move on finished housings as they are ejected.

Changed methods introduced in one plant in 1939 in the setting of tappets in engines has resulted in an increase in the number of tappets set per hour by 1 man from 96 to 201. Before tappets had been set hot; that is, engines were running and well warmed up; operators had been setting the old-style cap screw tappet and locking them in place. One man did a complete one on one engine and then moved on to work on the next.

Now tappets are set in cold engines as they move between the operators on a conveyor. Self-locking tappets are used which are supposed to stay set without a lock nut. Tappets set in this manner are reported to give less satisfactory operation, but the change has been vindicated by the tremendous savings in labor.

In one motor-assembly plant the installation of conveyors for the handling of car bodies as they are trucked in from body plants has resulted in considerable saving in labor. Before bodies had been handled on push buggies—that is what the workers call them (they are a flat truck) then stored until called for on the production line. Now with the conveyor picking up the bodies they are produced in the proper number of each style and are run directly onto the assem-

bly line. This has meant the loss of jobs to 25 of the 105 men previously engaged in this work.

In one medium-sized automobile plant a whole series of milling operations on engine blocks are due for elimination within the next year. A broaching machine costing \$750,000 is due for installation. One operator using an air hoist will lift the engine block onto a rail which will force it through this broaching machine. It is expected that the installation of this machine will mean doing away with 126 men in a department now employing 641.

These examples, as has been suggested before, represent only a fraction of the continuous changes going on in the industry. There is no reason to believe that this rate of change will be slowed down in the years to come. Every resource and ingenuity of engineering skill has been, and is being, applied to this problem of reducing the amount of human labor necessary for a given quantity of production. From discussions with men experienced in the engineering side of the industry it can be said that few major changes either in the production or methods are to be expected within the next few years.

The only basic change is likely to come about through the introduction of plastic bodies. Already we are informed that some production of plastic bodies has been carried on in European automobile plants. Although there is some evidence that these new bodies have not yet been developed from the point of practical production, those familiar with the industry predict their introduction within 10 years at the outside. The coming of the plastic body would mean a tremendous technological displacement through the elimination of labor necessary in stamping, painting, and finishing automobile bodies.

REGULARITY OF EMPLOYMENT

Mr. THOMAS. In listing the blessings which the auto industry has achieved for its workers, Mr. Court, whose figures we have had occasion to refer to before, mentions stability of employment. He says:

The average record of continuous employment (in the same plant) for men employed in the plants of members of the Automobile Manufacturers Association during 1938 was about 6 years. One-fifth of the men had 10 or more years in one plant.

Here again Mr. Court is giving the automobile manufacturers credit for what the union has accomplished in the face of their opposition. Stability of employment through the seniority system has been and continues to be one of the principal objectives of our union. However, the U. A. W.-C. I. O. cannot share Mr. Court's satisfaction even with present conditions in this phase of the auto workers' life.

The average record of continuous employment, as Mr. Court states it, does not reflect necessarily year-round employment. It is well known that a large proportion of workers whose only employment over a long period of years may be in one plant will have only partial employment.

A study made by the United States Department of Labor, Bureau of Labor Statistics, on stability of employment in 1934 states:

One third of the motor vehicle employees work throughout the year. One-half of the employees had less than 6 months work. Another quarter worked 6 to 10 months.

With constant fluctuations in production throughout the year there are also constant fluctuations of employment, as the Department of Labor statement indicates.

Mr. HINRICHS. May I make one comment at that point. I don't have the figures. I am sure you are quoting them correctly. As you have indicated, those figures relate to employment in an individual plant; in some instances—and we weren't able in that study to determine quite how many—the worker may have had employment opportunity in two plants. The general picture that you give of the large volume of short-time employment is quite correct. I don't want to minimize your statement, but I would like to make it technically quite accurate at that point because those figures have been in a good deal of controversy.

Mr. THOMAS. I would like to say this: You say the worker may have had employment in more than one plant. In the automobile industry that would be unusual, to say the least. The automobile industry strives and they compete with each other. They are all trying to beat the other fellow, so the result is they all come out practically at the same time, and they have their peaks and valleys at the same time, so it is practically impossible for an automobile worker to work in more than one plant for the duration of a year.

It should be noted that the Bureau of Labor Statistics study here includes salaried employees, who usually work a full 12 months, in addition to hourly rated employees.

Now this is the question you asked awhile ago.

Organized labor has learned through centuries of experience that the intent to check or destroy new machinery is plain social folly. We do not stand for artificially increased labor requirements in the production of any of America's basic commodities. What we are concerned about is that such technological advance should not be entirely at the expense of American workers, and the stability of American economic society.

It is our belief that in the past the benefits of technological improvement have been monopolized by the rulers of our financial and industrial systems. More efficient production has meant a greater and greater accumulation of wealth in the hands of the most powerful. This has been accomplished by what appears to be an actual decline in the total share of wealth produced going to the employees of industry. We are opposed to this tendency not only because we feel that it is unjust. We are opposed to it because we recognize that continued technological advance is impossible without an adequate mass market to consume the products of our new skills.

We believe in genuine technological progress, based upon and resulting in the greater welfare of the mass of our people. We are opposed both to the vicious speed-up system, which has nothing to do with genuine technological progress, and to the monopolization by the favored few of the benefits flowing from new productive power.

As the experience of the automobile industry shows, technological displacement is realized primarily through the failure of markets to expand in proportion to an expanding productive capacity. This, the United Auto Workers feel, is one of the basic causes for the unemployment, insecurity, and economic hopelessness of our present time. We are proud of our contribution to the solution of these problems

through the fight for the economic security of our own people. Organized labor does not believe that a solution to present-day economic problems will be found in the discovery of new and improved products. We believe that new and improved products will appear and bring industrial prosperity when the buying power of the American people as a whole is sufficient to make their production profitable. The experience of the automobile industry would seem to bear this out. American prosperity during the 1920's was based on automobiles, but automobile sales in turn were based upon the high level of income enjoyed by the American people during the first quarter of this century. Without that high level of income the automobile industry would have no more effect in developing our prosperity than it had in such countries as England, France, and Germany. In these countries, although technological advance proceeded as rapidly as in America, consistently low-mass purchasing power made impossible the circulation of new products to the general public.

The CHAIRMAN. Any further questions, Dr. Anderson?

Dr. ANDERSON. These figures on Ford production related to producing capacity will serve to explain the \$91,000,000 profit made by Ford in 1929 as well as the \$74,000,000 loss marked up by the Ford Co. in 1932. It serves to illustrate as well the fact that heavy investments in new machinery sometimes serve to defeat their own purpose, that is, the reduction of costs. I wonder if you would accept this qualification, although it may not necessarily explain the Ford situation. The obsolescence of a model and the loss of a market might reasonably explain Ford's difficulty, rather than his investment here in heavy production machinery that didn't yield.

Mr. THOMAS. That is another factor that enters into it, I believe; yes.

Dr. ANDERSON. Would you hold that any machinery is installed by a motor maker without having first, from an economic standpoint, determined that it will reduce cost in a particular unit where it is to be placed?

Mr. WISHART. That is on the assumption of a certain mass production; yes.

EFFECT OF MECHANIZATION UPON SKILL

Dr. ANDERSON. I want to refer to a question of Mr. Ford's we had before you started this afternoon, and that is this one of degrading of workmen, which seems to be of real importance not only in terms of the satisfaction of the workers involved but in terms of purchasing power and general social well-being. Beyond what you have stated in this document, what do you think is occurring at the present time in the automotive industry? Are workers being degraded to the semi-skilled and unskilled level, or is there increasing use of skill in the automotive industry?

Mr. THOMAS. In the automobile industry the tendency is more toward lower skilled occupations all the time?

Dr. ANDERSON. Do you see any immediate prospect of full employment in the automotive industry?

Mr. THOMAS. I don't.

Dr. ANDERSON. What, in your judgment, is the proportion of unemployed automotive workers, either registered with unions or non-

union workers, available for labor and seeking work, in proportion to the total force?

Mr. THOMAS. Well, that is pretty hard to estimate, due to the fact that in our industry, as I said in this statement, a lot of men come into the industry from southern States and during the depression years have gone back there and we have no way to account for them now. If I would give a guess it would certainly be a very, very rough guess.

Dr. ANDERSON. In other words you have had an influx from states other than the automotive states?

Mr. THOMAS. We are in bad shape today. A lot of them have left the state.

Dr. ANDERSON. Do you know anything about the circumstances of those who left to find employment in their home states?

Mr. THOMAS. No, they can't; as far as I can learn they keep every once in a while coming back to Detroit, trying to get jobs, and I have talked to a number and they say it is impossible for them to get jobs any place.

Dr. ANDERSON. Who were those people who came from other states? Were they farmers, or people from the farms?

Mr. THOMAS. Yes.

Dr. ANDERSON. And they made——

Mr. THOMAS. They were perhaps sharecroppers and small tenant farmers.

Dr. ANDERSON. This trend toward shorter hours, do you see any evidence that that trend is flattening out? Is there any leveling off of the hours of employment?

Mr. THOMAS. In organized shops we have got it pretty much leveled off now per day, if that is what you mean. It is pretty much an 8-hour day now in the industry.

Dr. ANDERSON. Are you directing any effort toward an annual wage?

Mr. THOMAS. Well, we are trying in all our negotiations to convince management that it would stabilize the industry a lot more if they would agree to an annual wage and we also think it would help the unemployment situation. We think the automobile manufacturer is well able to afford it by establishing a 6-hour day, 30-hour week. Of course we haven't been able to sell that to the manufacturer yet.

Dr. ANDERSON. Well, what are the annual earnings, average annual earnings of wage earners in the automotive industry? Let me put it this way, is it possible to get figures from your union that will indicate, by grade of labor, the rates of pay and earnings of workers? Do you have any such data?

Mr. THOMAS. We could get a large cross section and try to strike an average on something, yes, but it would be a very difficult job.

Mr. ANDERSON. Well, in your new labor contracts are you turning increasing attention to such matters as lay-offs and dismissal pay and retirement and other social benefits?

Mr. THOMAS. Yes, but that is another thing we have made very little progress with at all. The automobile workers have been called "dead-end kids" in the labor movement. The automobile industrialists who so many years ran the industry as open shops, fight violently against any new innovation in the industry, and it is a hard job for us to make any progress at all on what we feel would be of any

economic benefit to the country at large. They would resist with their last dollar, I guess, if it became necessary. The Automobile Manufacturers Association themselves say that in the season of '38 and '39, the average was \$1,328; in '37 and '38 it was \$906.

Dr. ANDERSON. That is average full-time earnings?

Mr. THOMAS. Yes. No automobile worker—I say no; 95 percent of the automobile workers never work a full year. I don't believe I ever worked a full year in the 15 years I was in the automobile industry, that I recall.

The CHAIRMAN. What was that figure?

Mr. THOMAS. For the season of 1938 and 1939, \$1,328.

The CHAIRMAN. The average?

Mr. THOMAS. Yes.

The CHAIRMAN. And what does that include in the category of work? Does it include everybody in the automobile industry?

Mr. THOMAS. This is employees.

The CHAIRMAN. Does it include the office employees?

Mr. THOMAS. Only hourly rate employees, and it doesn't include the Ford Motor Co.

The CHAIRMAN. Now, do you regard that as accurate?

Mr. THOMAS. I think it would be very close; yes.

The CHAIRMAN. In other words, the average hourly employee, though he doesn't work a full year; earns more than \$100 a month in the year?

Mr. THOMAS. In a good year. Of course 1938 was considerably lower than that.

The CHAIRMAN. This figure, then, refers only to a specific year?

Mr. THOMAS. That is right.

The CHAIRMAN. And what would you say would be the average for the last 10 years? Of course that might be an improper question because of course you had the depression years.

Mr. THOMAS. In these figures here the season of '33 and '34 was \$749; '34-'35, \$1,014; '35-'36, \$1,294; '36-'37; \$1,399; '37-'38, \$906; '38-'39, \$1,328.

The CHAIRMAN. By and large that is a much better record for labor than would have been possible 15 or 20 years ago, probably, isn't it?

Mr. THOMAS. Yes; but I remember 15 or 20 years ago when living costs were considerably lower, too.

The CHAIRMAN. That is true, but I mean it is true, is it not, that there has been a general improvement?

Mr. THOMAS. There has been in the last several years, as I stated in my brief here; in the last several years in which we have had organization we have increased wages considerably.

The CHAIRMAN. In other words you don't deny there has been an improved condition?

Mr. THOMAS. Certainly not.

The CHAIRMAN. But contend the improvement isn't sufficient to sustain our economic system?

Mr. THOMAS. That is right.

The CHAIRMAN. And it doesn't provide employment for all who need jobs?

Mr. THOMAS. That is right.

The CHAIRMAN. You are quoting from this book of the Association of Automobile Manufacturers. Did you also bring this document to the room?

Dr. ANDERSON. I am responsible for that, Mr. Chairman. I brought it the first day and handed it to the committee, the documents that were available. This particular document, I might say, is from the Automobile Manufacturers Association; the study is considered the basic economic study in the field and so far as I know literature of this kind it is the most competent job that has been done.

The CHAIRMAN. Well, I note it begins with this sentence from Don Quixote, to the effect: "No greater knight errants have sought to exorcise the imagined devil in labor-saving machinery." I suppose you have read this document. Is that the tone of it?

Dr. ANDERSON. After the first paragraph the economists who wrote this document apparently moved into some economic analyses and forgot about the first paragraph.

Mr. THOMAS. These figures I quote here are from a study by the Brookings Institution, which they got from the Manufacturers' Association.

The CHAIRMAN. Well, I observe that the author of this pamphlet distributed by Dr. Anderson is Mr. Andrew T. Court, an economist whom you have quoted, apparently, from time to time.

Mr. PIKE. Not with the highest approval, however.

The CHAIRMAN. That is what I am getting at.

Mr. PIKE. He has quoted a good many of those same figures.

The CHAIRMAN. I am told that Dr. Court is in the room. Would it be proper to give him an opportunity to dispute Mr. Thomas?

Dr. ANDERSON. I might say, by way of explanation, Mr. Chairman, that in these hearings we have made every effort to secure all the facts available.

The CHAIRMAN. I hope so.

Dr. ANDERSON. In these hearings we have tried to get all attending parties into the room for the discussion of their particular points of view. We early asked the Automobile Manufacturers' Association to have a representative speak for them here. As a starting point we made an analysis of this document, which was their statement of the case. Since Mr. Paul Hoffman, of the Studebaker Co., could not come to testify, they decided not to have a representative at the hearings, but it was agreed that if any witness should refer to this study, we would give them an opportunity to be heard in refutation. If Mr. Court is here and would like to be heard now we would be glad to hear him.

The CHAIRMAN. Is Mr. Court present?

Mr. COURT. I am present. The questions raised mainly are technical questions between the relative usefulness of the figures from various Government departments, and I don't think I am prepared to comment on that.

The CHAIRMAN. All I want to say is, Mr. Court, if you do care to make any statement, I am sure the committee would be very glad to have you do it at your own convenience.

Mr. COURT. Thank you very much. Not at this time.

The CHAIRMAN. Are there any other questions to be asked of Mr. Thomas?

Mr. HINRICHS. I indicated earlier that I wanted to make some observations with reference to the reference to census figures in the Bureau of Labor Statistics figures. There is no essential controversy, but I think that a clearer statement of the facts might be helpful for the record. The increase from 1929 to 1937 which appears to be larger in the Bureau of Labor Statistics series than in the census figures, is due to the fact that in 1937 and before we had included the steel-making and foundry establishments in the automobile industry, and the 1937 census excluded them from its count of the industry. In 1929 those particular parts of the industry were relatively unimportant. We normally adjust our classifications to correspond with those of the census so that there won't be any difference in the two sets of figures. Our figures, however, are compiled primarily in order to show month-to-month fluctuations between census periods, and the reports come to us voluntarily from the various manufacturers.

The automobile industry was apparently unable to furnish us a break-down of their employment figures on a monthly basis. It was indicated by the census figures and in order to get comparable figures from month to month we have had to carry our figures forward. Now there is no question that there is a discrepancy between the two. It doesn't have anything to do with the reliability of one set or the other. One merely needs to know the differences in content, which in this case affects on the one hand the automobile figures and on the other hand the iron and steel figures.

The CHAIRMAN. In other words every statistician will defend his estimates?

Mr. HINRICHS. Our figures are perfectly all right, but the point of view for which they are published differs.

Mr. WISHART. We were not attacking the Bureau of Labor Statistics or the Census of Manufactures. We were attacking the comparison of things fundamentally noncomparable. As you have pointed out, the census figures and B. L. S. figures cover different sections of the industry; since the B. L. S. has not included the same things, of course, there is a discrepancy there which appeared to cover up the actual technological displacement which had occurred.

The CHAIRMAN. If there are no other questions, Mr. Thomas, we are very much indebted to you for your presence here and your testimony. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon at 5:10 p. m. a recess was taken until 10:30 Thursday morning.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

THURSDAY, APRIL 11, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Wednesday, April 10, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representative Williams; Messrs. O'Connell, Pike, Hinrichs, and Brackett.

Present also: George E. Bigge, Social Security Board; Frank H. Elmore, Jr., Department of Justice, and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. We propose today to present two witnesses, both familiar with the steel industry, to examine into the problem of technology in steel. This morning's witness is Mr. Charles Hook, president of the American Rolling Mill Co.;¹ this afternoon's witness, Mr. Philip Murray, chairman of the Steel Workers' Organizing Committee. Mr. Hook has prepared a statement and is now ready to testify.

STATEMENT OF CHARLES R. HOOK, PRESIDENT, THE AMERICAN ROLLING MILL CO., MIDDLETOWN, OHIO

Mr. Hook. It is not my intention to attempt any theoretical analysis of the effects of technological innovations on employment. It seems to me, however, that most economists and businessmen are agreed that technological improvements tend to stimulate the demand for labor, and do not of themselves bring about prolonged periods of unemployment.

I believe it has been thoroughly established that ever since the introduction of power machinery, there has been a continuous increase in the output per man-hour in industrialized countries. This increase in man-hour output, as we all know, has been accompanied by increased employment, shorter working hours, improved working conditions, and an ever-advancing standard of living.

It is true that the introduction of a labor-saving device may cause some immediate displacement of individual workers. Likewise, workers in some trades may be displaced when new products, as was true of the automobile, appear upon the market. Such temporary dislocations are inevitable in a progressive society, and they need

¹ See Hearings, Parts 19 and 20, for previous testimony of Mr. Hook.

cause concern only when the displaced workers are unable to find other employment without prolonged delay.

It is my observation as a businessman that the time which must elapse before any displaced workers are reabsorbed into other lines of work depends upon general business conditions and the relative freedom from causes which restrict the free flow of capital. The elapsed time is brief when all factors are favorable, as during the postwar period of the early 1920's, when employment gained simultaneously with many technological advances.

The elapsed time may be longer when general conditions are unfavorable as they have been in recent years, but the experience of the last century seems to provide no evidence for concluding that technological improvements cause permanent unemployment or help to bring about prolonged depressions.

Periods of business depression always give rise to efforts to locate the focal point of infection. This is not the first time the finger of suspicion has been pointed at so-called technological improvements as the chief cause of unemployment.

The clamor against improvements in manufacturing techniques has been raised many times during the past 150 years. On such occasions the charges have been shown by subsequent events to be unfounded and fallacious. Notwithstanding these lessons of history, the old exploded theory, like Banquo's ghost, has come to life again wearing the label of "technological unemployment."

Actually it is impossible to measure precisely the broad effect of the introduction of a machine upon either employment or output per man. Many factors enter into the determination of changes in employment and man-hour output.

Technological innovations relating to blast furnaces and open-hearth processes, mechanical and electrical equipment, labor-saving devices, improvements in supervision, better working conditions, incentive systems, and so forth, are all factors which may permanently influence change in output per man-hour. To attribute a given increase in output per worker to any one of these many factors would seem to me highly theoretical and, from a practical point of view, impossible to demonstrate with any acceptable degree of accuracy.

Since I regard it as wholly unfeasible to attempt any precise measurement of the effect of technological change on employment, it is my intention, following these preliminary remarks, to present for the consideration of the committee a factual record. This record will cover changes in a large unit of the company with which I am associated and in which the continuous sheet mill represents the outstanding technological improvement.

For that purpose, I have chosen the period covering the years 1926 down to 1937, because it was during that period that all but one of the continuous sheet rolling mills were introduced into the steel industry.

Following the presentation of data relating to my own company, I shall show comparable data as to employment in the iron and steel industry for the same period. All these data show conclusively that the installation of continuous mills have not reduced employment.

With the committee's permission I will present this factual record in considerable detail with charts and tables.

FIRST CONTINUOUS SHEET MILL INSTALLED IN 1926

Mr. Hook. Before doing so, I should like to comment briefly on some of the striking changes in the steel industry which have taken place since the invention of the continuous sheet rolling mill. Since the first continuous sheet rolling mill was put into operation, 27 such mills had been installed by 1937, representing a total investment by the industry of approximately \$500,000,000. Building that equipment has provided work for thousands of workers in the construction and equipment industries.

It has been alleged that 85,000 to 90,000 workers have been displaced by the continuous sheet-mill process. Such a claim is shown by an examination of the facts to be wholly without foundation.

In 1926 a total of 1,264 hand mills for producing hot rolled sheets and black plate were in existence. The greatest number of men that could have been employed on these mills, on 3-shift operations, would have been approximately 43,000, or only about 10 percent of the total number of workers employed in the entire iron and steel industry at that time.

Obviously, if all of the hand mills in existence in 1926 had been eliminated by the introduction of continuous sheet mills, the total number of job displacements could not possibly have been even one-half of 90,000. But actually there are still 750 of those mills in existence with approximately half in operation. That is a reduction of the number of men employed on hand mills of about 27,000. But for the steel industry as a whole we had an actual increase of working forces of 117,000 men from 1927 to 1937. Total employment in the steel industry increased from 427,000 in 1927 to 544,000 in 1937, according to figures of the United States census, an increase of 27.4 percent, while in the meantime the population increase has been 11.2 percent, according to the same source.

Mr. HINRICHS. Just one question at that point. You use the phrase "27 continuous sheet rolling mills" and then you speak of 1,264 hand mills. Are the hand mills separate enterprises?

Mr. Hook. They are the old method, the old sheet mills which I will show in a picture in a few minutes.

Mr. HINRICHS. I see; they are separate enterprises and not a part of the factory enterprises, with 3 or 4 mills.

Mr. Hook. No; they are not separate. We make sheets on the old steel mill, just as we make sheets on the continuous rolling mill.

Mr. HINRICHS. And the mill that you refer to as a hand mill is the machine, not a factory.

Mr. Hook. Oh, no; it is a machine. In other words, we made sheets on these old hand mills prior to 1926, or in our case prior to 1924. Now then, we introduced to do that same job the continuous sheet rolling mill. Do I make myself clear?

Mr. HINRICHS. Quite.

Mr. Hook. Of course it is true that when a continuous sheet mill replaces hand mills more jobs are affected than those of the immediate hand mill crew of some 8 or 10 men. Other jobs on operations back in the plant leading up to the hand mill or connected with its maintenance are affected also. But that does not mean that such jobs are eliminated. In most cases they are merely changed.

Men who were skin passers, shearmen, bundlers, oilers, weighers, picklers, and cranemen on the hand mills are doing the same kind of work on the continuous mills. I have cited only a few examples. There are many more.

Not only are such jobs held over in the continuous mill operation, but in some categories the number of men required is greatly increased.

Moreover, the continuous mill creates new jobs which do not exist in the hand mill. I will name only a few of these, such as bearing setters and helpers, welders, recoil operators, and stitcher operators.

Another factor bearing upon the record of increased employment in the steel industry is the significant increase in the production of light flat rolled products from 6,327,000 tons in 1926 to 10,793,000 tons in 1937. That required more workers in the blast furnace, the open hearth, and in all finishing, processing, and shipping departments. It must also be realized that many new technical, administrative, and selling jobs have been created by this increased volume of production.

I am sure that there is unanimous agreement among consumers of sheet steel that the improvement in quality and properties of this product, resulting from the continuous mill, has made possible extensive improvements in many widely used consumer articles. Notable among such improvements are those in the automobile, washing machine, electric and gas range, kitchen cabinet, and refrigerator industries, all of which have resulted in providing for the consumer a constantly improved product at a steadily reduced price.

Steel users not only have benefited from improved quality, which makes for possible lower fabrication costs, but they have also enjoyed the advantage of lower prices as well. From 1926 to 1939 the average prices of all iron and steel sheets realized by our company declined 31.1 percent.

ADVANTAGES TO LABOR FROM CONTINUOUS MILLS

Mr. Hook. Advantages from the continuous sheet mill process have come to labor in two important ways.

First, workers have benefited from the lightening of their task and from the improvement of working conditions in the rolling mills. As a former worker in the mills myself, I speak from personal experience when I say that the work on the old style hand mill was one of the most arduous and difficult of any in the steel industry. The continuous mills, wherever they have been installed, have completely eliminated all of the difficult and taxing manual phases of work in the rolling mill.

Second, workers have benefited from the broadening of markets brought about by the continuous sheet mills. Changes in the quality and properties of sheets made by the new process are so great as to amount practically to the introduction of an entirely new product in the steel industry. It is a product which lends itself to uses and applications utterly beyond the scope of old style sheets.

Accordingly, workers are employed in the production of large tonnages of sheet steel for uses wholly nonexistent before the appearance of the continuous mill. I could mention, for example, the steel auto top, and one-piece auto fenders, each of which is stamped at a single operation from a single wide steel sheet.

Moreover, since 1926, average earnings of workers in the steel industry have increased from 63.6 cents an hour to 84.7 cents an hour, a gain of 32 percent. Meanwhile, there has also been a substantial shortening of hours of work.

The hot-rolled production of other than light flat-rolled products in the years 1926 to 1937 shows a reduction of 11 percent, or approximately 3,700,000 tons, while at the same time the light flat-rolled products increased approximately 4,500,000 tons, requiring about 45,000 men. This number of men is more than was previously employed in all of the sheet mills in 1926. It is evident, therefore, that the introduction of the continuous rolling mill has not been accompanied by a decrease in employment, but on the contrary, since its adoption, the number of workers in the steel industry has materially increased.

Now, Mr. Chairman, with your permission——

The CHAIRMAN (interposing). Now to what do you attribute, Mr. Hook, this material increase in the number of workmen?

Mr. Hook, I am going to show you in the charts that follow, and some of the exhibits, one small exhibit that I have here.

The CHAIRMAN. I see.

Before you turn to the charts, it just occurs to me to make this comment. I think that in the entire discussion of technological improvement and its relation to unemployment, there is constant danger of misunderstanding of the terms in which people are talking.

Mr. Hook. That is possible.

The CHAIRMAN. There is no doubt, I suppose, that there are persons who believe and who say that the machine as such is responsible for unemployment, but I can't recall any person in any responsible position as having said that in my hearing, or of saying it in any document that I have read.

The question, I think, revolves around the actual fact of labor displacement.

Mr. Hook. That is right.

The CHAIRMAN. Which apparently is recognized by all industrial leaders, and is apparently recognized in your statement.

Mr. Hook. No; I think I said not displacement—pardon me, Senator.

The CHAIRMAN. This is what you say on the first page:

It is my observation as a business man that the time which must elapse before any displaced workers are reabsorbed into other lines of work depends upon general business conditions and the relative freedom from causes which restrict the free flow of capital.

Mr. Hook. Correct.

The CHAIRMAN. Now that sentence seems to recognize that there is such a thing as displacement of workers.

Mr. Hook. Temporary, because I say until they are reabsorbed.

The CHAIRMAN. That is right. And the question therefore, revolves around the ability of industry as a whole, business as a whole, not merely mechanical industry but the whole economy, to reabsorb persons who are displaced, because there is apparently such a thing as displacement of individuals.

Mr. Hook. That is possible, but taking it as a whole——

The CHAIRMAN (interposing). Is it possible or is it a fact?

Mr. HOOK. If that individual is displaced, another man is employed, maybe 30 miles away.

The CHAIRMAN. That is right. That is exactly the point—

Mr. HOOK (interposing). Plus another man, probably.

The CHAIRMAN. That might be very true. That, of course, is the very point of impact. The particular person loses a job though another, or 2 or 10 jobs may be created somewhere else. And the problem of reabsorbing the displaced worker as set forth in this sentence of yours is, as I see it, the heart of this problem. Do you agree with that statement?

Mr. HOOK. Well, it is a problem and industry has been making a great many studies. For instance, the National Association of Manufacturers now, Senator, have a committee at work, just as we studied the worker over 40 and proved fallacious the general statement, that is often made, that industry was not employing the worker over 40. And that report shows that in recent years the proportion of men over 40 are greater than they were in the twenties.

The CHAIRMAN. And I think it would be proper for me to say here that my observation of this whole economic problem throughout this study has given me a great deal of encouragement by reason of the very obvious effort that is being made by men like yourselves, and by organizations like the National Association of Manufacturers, to study the very problem that we are studying, and to bring about beneficial social results. I think there can be no doubt about that. We are all working, as it were, toward the same end.

There can be no doubt, either, it seems to me, that the development of technology and the introduction of new devices like your continuous mill, which have the result of enabling you to produce your sheet at a lower price, necessarily results in making that sheet available for commodities and other industries for which it was not available at the higher price, and thereby tends to open the door of opportunity to those who didn't have the open door before.

Mr. HOOK. Correct.

The CHAIRMAN. I was curious, however, to ask you whether the re-employment of workers as indicated in your statement, of more workers than had been in the industry before, tends to keep your cost up, and if it doesn't—which apparently is not the case from your conclusion—how is it that with maintenance-of-labor costs you still can reduce the price of the commodity?

Mr. HOOK. I will show that to you, I think very clearly on the charts, Senator.

Senator KING. A temporary displacement doesn't mean a permanent one. Of course that is a question that answers itself.

Mr. HOOK. No, indeed, Senator.

Senator KING. In other words, when you introduce machinery in which you displace A, B, and C, perhaps with the new machine A would be employed and X, Y, and Z be employed.

Mr. HOOK. Correct.

Senator KING. So there would be a temporary change or transition from one position to another.

Mr. HOOK. And as I go through his explanation using facts, the actual factual records, I think many of the questions that may come to your mind, Senator, will be cleared up.

The CHAIRMAN. Of course, some of us are looking at this problem as a whole and not from the point of view of a particular industry. Unemployment is a major fact that stares us all in the face. Now, this unemployment is not by any means all industrial. Some of it is agricultural, some of it is professional, and what not. It is to be found in all lines of endeavor. But for years now Congress has been trying to make work for persons who apparently are unable to find work in normal avenues, and our problem, the problem of the National Association of Manufacturers, and the Association of Automobile Manufacturers, and the problem of Congress, is how to coordinate the efforts of all to lift this burden of making work off the Government which is doing it only by piling up debt.

Mr. HOOK. We agree with you on that, Senator, 100 percent.

EFFECT OF CONTINUOUS MILLS ON AGE OF WORKERS

Mr. HINRICHS. I would like to come back for just a moment to your statement about the possible displacement of a worker here and the employment of another worker 30 miles away, or even next door. Most of these hand mills were in operation in the early twenties, were they not?

Mr. HOOK. Correct. Some of them still are operating today.

Mr. HINRICHS. Some of them still operating. Let's start, for example, in 1923. You had a fully equipped hand-mill staff with personnel. Minor improvements would possibly reduce the total amount of labor that you needed in the mill, possibly some expansion of the mill might require you to add a few workers. By and large, however, you had, barring large fluctuation in the total volume of production, relatively steady employment from year to year.

With that group fully employed in 1923, you would have tended to hire the same people in 1924, the same people in 1925, in 1926. There were deaths, retirements, accidents, and that sort of thing, so that you did have some new hiring, but it is a tendency in any business enterprise that is fully established, for the average age of the workers in that establishment to rise from year to year, isn't it?

Mr. HOOK. Yes; as the individual company gets older, you don't—

Mr. HINRICHS (interposing). Your workers get older with you.

Mr. HOOK. Of course.

Mr. HINRICHS. Now then, you come along to 1933, 1936, and 1937, and open a new mill. Insofar as the workers in this old hand mill are displaced and not provided for in the new mill or transferred to the new mill, the workers who were in that hand mill in 1935 are a relatively old group as compared with the total working population, because a very high proportion of them were with you back in 1923, 1920, 1915.

Mr. HOOK. That's correct.

Mr. HINRICHS. When you come to open up a totally new employment opportunity as a business enterprise, you are not normally hiring a straight cross section of the working population. There, starting up a new enterprise, you are much more likely to be hiring younger workers. Isn't that true?

Mr. HOOK. No; that is not necessarily true, Mr. Hinrichs. Let me tell you just what did happen, because we don't need to theorize about it. The continuous rolling-mill process has eliminated the old back-breaking jobs so that in the plant now, the continuous mill, the fellow can work to an older age than he could under the old process because the old process was so hard, and I hope that I can persuade you to come out to Middletown and see this in operation; see the old with the new.

Mr. HINRICHs. I have seen them, but I recognize that fact. I also saw a mill in which a very high proportion of a high-school class had been hired. I wasn't theorizing when I spoke about the tendency of business, of a new enterprise, to hire younger workers. You will find, for example, if you take relatively new industries, as compared with relatively older industries, in the census figures, there is a very great difference between the average ages in the old industries and in the new industries. It may not be applicable to your particular situation, but it is not a theoretical situation; displacement in older plants tends to be of an older age group and hiring in new plants tends to be of a somewhat younger age group. The equivalents that you are setting up in this process of one worker here and one worker there is very often a problem of hiring a man of 45, or putting a man of 45 on the labor market again and hiring workers generally 25 to 45 years old (the preferential hiring ages) if you are looking forward to an establishment that you are going to have operating de novo from year to year.

Mr. HOOK. You are talking about two different things. For instance, you are talking on the one hand about a new enterprise, and what we are discussing here is the effect of a new process on those who were formerly operating and making the same product by another method. Now, they are two different things, and what I am saying to you is that this new process, having eliminated the old back-breaking jobs, has made it possible for these old men to work to a longer number of years in the plant than they could have under the old process.

Mr. PIKE. Still in the same enterprise.

Mr. HOOK. And still in the same enterprise.

The CHAIRMAN. Do you show that in your charts?

Mr. HOOK. Yes.

The CHAIRMAN. May I say, then, I must apologize to you, Mr. Hook, because last night you requested me to permit you to make your statement before the questioning, and I was the first to offend.

Representative WILLIAMS. I would like to ask a question before you leave that.

Mr. HOOK. I want to do everything I can to enlighten you.

Representative WILLIAMS. I see from your statement that the actual employment in the steel industry during the 10 years under consideration increased 177,000.

Mr. HOOK. It is 117,000, I think, Mr. Williams.

Senator KING. Was that for the whole steel industry?

Representative WILLIAMS. That was the whole industry, as I understand your statement.

Mr. HOOK. Of which we are a part—blast furnaces, steel works, and rolling mills.

Representative WILLIAMS. Of course, that is evidently not true as to other industries.

Mr. HOOK. I am only here giving you the facts with reference to the steel industry, but we have a chart at the end—by the way, we are using Department of Labor figures—which shows the results in manufacturing industries as a whole, and I think maybe we will answer the question that is in your mind, Mr. Williams, at that time.

Representative WILLIAMS. I wonder if you have the facts which would show the productivity of the industry during those 10 years, as compared with the number of increased employment. What is the relative improvement in productivity during that same period?

Mr. HOOK. We will show you that very clearly.

The CHAIRMAN. All right, then, Mr. Hook, we will allow you to proceed with your charts and we will try not to interrupt until you are finished.

Mr. HOOK. It is very difficult, I realize, to get a picture of this thing. I only wish I could get the whole committee to come out to Middletown, so you could study it for 2 or 3 days, and then I think we could make it very clear to you.

Senator KING. Mr. Hook, I was not quite clear from your statement, when you stated 117,000 persons were employed in the steel industry. Aren't there a lot more than that number employed?

Mr. HOOK. That is the increase, only the increase during that period, Senator.

OPERATION OF CONTINUOUS MILLS AT MIDDLETOWN

Mr. HOOK. Now, if you have a copy—I hope we had copies for you—of this diagram, because it is difficult eye strain for you to see it from here, but you can look at this and glance down at the diagram that is in front of you.

Dr. ANDERSON. These are to be exhibits in the record, or are these appended to the testimony?

The CHAIRMAN. Will you be good enough to see that each is properly numbered as Mr. Hook discusses it.

Mr. HOOK. I will try to the best of my ability to give you a picture of the chart.

Dr. ANDERSON. The exhibit number is 2453. If you can give it a name we can identify it as well.

Mr. HOOK. "Diagram of a complete rolling-mill plant producing sheets."

(The chart referred to was marked "Exhibit No. 2453" and is on file with the committee.)

Mr. HOOK. The object of this diagram is to show you a complete plant. This happens to be a diagram of the American Rolling Mill Co.'s Middletown, Ohio, plant showing the various departments of the plant, starting with ore and coal, right through to the finished product. And we have here a flap, because here is where the continuous mill was put in. In other words, the men who worked on the old hand mills, which are being displaced by the new continuous mill worked in the section outlined on the chart in heavy ink, beginning with the third row of drawing. The men that worked in the blast furnaces made the pig iron that was taken to the open-hearth furnaces—we show eight open-hearth steel furnaces, where we take the

hot metal, mix it with scrap and limestone, and the product is a steel ingot. That steel ingot is taken and heated in what we call the soaking pits. In other words, the ingots are put in there to soak so that both the outside and the inside of the ingot have the same temperature. That is very important, because when the ingot comes from the open hearth over to the soaking pit, the inside of that ingot is probably in a molten state, and you see we have to let it soak so that the ingot is the same temperature all the way through.

Then that ingot is taken out of the soaking pits, and we will describe the old process first, and go through what we call the slab mill or the blooming mill. Under the old process we made a billet, we will say 8 by 8 or 6 by 6, depending on the size of the sheet bar we are going to make, and then that billet was taken and rolled through what we will call the bar mill, and when we got through we had, possibly, a sheet bar approximately 110 feet long, and ranging from, say, three-fourths or one-half inch thick up to maybe 1½ inches thick, depending upon the thickness of the sheet that you were going to roll out of it.

Well, then that long sheet bar—and we will say this is that long sheet bar—on emerging from the bar mill, was cut up into pieces. We call those the sheet bars for the sheet furnace. In other words, if we were going to roll a sheet 24 inches in width, we cut this bar 26 inches in length, because you have to allow for the scrap on both ends. When the sheet is sheared out you have a perfect pattern 24 inches in width.

Then those sheet bars—and you can remember that when I show you a picture here later—were put back and forth by hand through these old sheet mills. In this plant of the American Rolling Mill Co. at Middletown there were 22 units with 2 stands each; one is a roughing mill and one is the finishing mill. Lifting the pair into the pair-heating furnace, lifting them out, putting them on the floor plate in front of the roughing mill, swinging those bars over from the roughing mill to the finishing mill, and putting them through the mill, taking them off, putting them into the furnace, was all done by manual work, and some of those packs weighed 150 pounds. If you ever worked in a rolling mill you will know what that means.

The CHAIRMAN. This device that you are explaining, the old device, is not dissimilar to the mills by which copper wire is rolled, is that right?

Mr. Hook. That is a different mill.

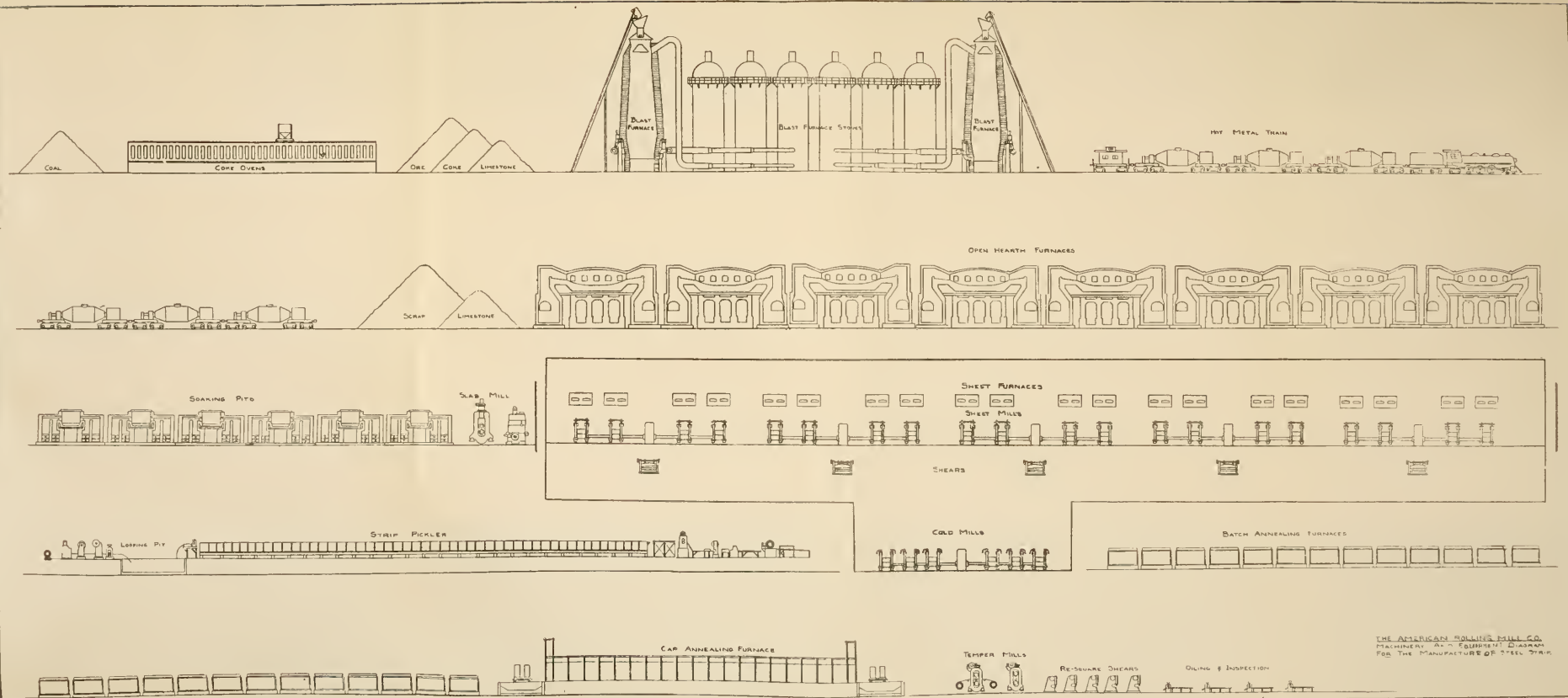
The CHAIRMAN. It is a different type, but I say it is not dissimilar. I have been in copper-wire factories out in Montana.

Mr. Hook. The old rolling mills, where they rolled out copper sheets, are not dissimilar, because they had to make the slab and work from the slab and roll it through by hand just as we did sheets.

Then we took these short bars, as I said, and put them through these old sheet hand mills, and when we got through we had a number of sheets. We call that a steel sheet, the green steel sheet. That is finished to gage, to the thickness that you want, at this point.

Then those sheets were taken and put through what we call two-high cold mills, simply to flatten them and give them temper. Then they were put into annealing furnaces to anneal them, or to bring the structure back to a proper state so that they can be worked, but

EXHIBIT No. 2464
 [Submitted by the American Rolling Mill Co.]
 Diagram of a complete Old Style Hand Mill producing sheets



ho
in;
so:
so
ter
fro
ing
so;

de:
mi
we
we
thi
we
ing
11½
yo,

she
Wo
f
26
enc
inc

you
the
Co
a r
the
pla
the
the
by
you

vic
is t
1
]

sim
1
she
wo

the
nur
Th:
poi
1

hig
the
the

before they went in there they went through batch picklers. This chart shows the continuous mill area for pickling, but in the old process, with these 22 mills, this area took a smaller space. This is the space that the new mill takes, and this represents approximately the area we needed for annealing under the old process. This is the area that we anneal in in the continuous process, so that under the continuous process a large number of men were increased in this area here, here, and here, to the finished product.

Now, that is the old process.

Now, I want to show you that the new process affects directly only the men who were employed in the area marked out in the chart with a heavy black line.

Because some people might get an idea that this new continuous process affected the workers all over, and it was only in that rolling-mill department—

The CHAIRMAN (interposing). In order that this may be understandable in the record, I think we ought to give this slip sheet another exhibit number.

(The addition to the chart referred to was marked "Exhibit No. 2454" and faces p. 16401.)

Mr. Hook. Now, in the continuous process, we use the slabbing mill just the same, but, of course, the whole bar mill is cut out. There were very few men on that. And we start with a slab which comes through the slab-heating furnace and then it goes through without stop, right through this series of mills in Exhibit No. 2454, say, 12 four-high continuous mills, or 3 or 4 two-high, and the balance four-high, and emerges at the end, maybe 1,200 feet long, rolled up like a big roll of paper. And then that is taken, if it is to be further reduced for certain purposes, to what we call the cold-strip mill, and in some instances we take the 0.109 thickness sheet and reduce it cold, without any heating at all, in those 3 stands of mills.

Of course, that is a continuous process, whereas before you had these 22, which meant 44 distinct groups of mills, and here you have one continuous plant that does all this work and makes, oh, in that particular plant at least 3 times the tonnage that the old plant made on those 22 hand mills.

This was presented simply to give you a picture of the fact that this continuous mill only went into part of the plant, and only affected men in part of the plant.

Now, this pictures the old mill. This is what we call a roughing mill. The man put the bar into the mill and when he got through, he swung around to this mill. It was put in the furnace and heated, and here is the roller putting the pack through the old-style mill by hand. There is the hot pack on the next mill, lying on the legs ready to be taken off by the heater.

Mr. Hook. This shows the back side of the mill, with the man who had to catch the pack when it came through, raise it up, push it over to the other side, so the fellow on the other side could catch it, as this other photo shows. So you can see the kind of back-breaking work that they had.

Dr. ANDERSON. That man on the catching, what is he technically called?

Mr. Hook. Catcher, in the old mills.

Now, here is a picture showing you the hot-strip mill. It shows 1, 2, 3, and 4 stands, but there are 8 others down through the plant that you can't see.

Mr. Hook. This is the cold-strip mill where I told you we would take a 12-gage sheet in a coil—see how it is rolled up there like a big roll of paper—and start it in one side and bring it out the other, a highly finished 22-gage sheet.

(The photographs referred to were marked "Exhibits Nos. 2455 to 2459" and are on file with the committee.)

Mr. Hook. The table entitled "Continuous Sheet and Wide Strip Mill Installations" is simply to show you the 27 installations and when they were put into operation; the American Rolling Mill Co. is the first one in 1924, and next is the plant of the American Rolling Mill Co., at Butler, Pa. The middle column of figures gives the size, that is, the length of the rolls. The size of sheet that you roll on those mills on those length rolls would be approximately 6 inches narrower than that length.

The last column shows the annual capacity figures, the average gross tons that those mills would probably produce.

(The table referred to was marked "Exhibit No. 2460" and is included in the appendix on p. 17326.)

Mr. Hook. The purpose of the table entitled "Estimate of number of hand workers employed in industry in hand-mill processes, including preparatory, rolling, and shearing operations" is simply to reiterate what we said in the statement, that in 1926 there were 1,264 of those old-style mills, and those 1,264 made a production of 6,327,874 tons, with 165 tons per worker on sheets and 125 on black plate, black plate being what we use for tin plate and products of that kind. The number of workers required to operate the 1,264 mills was 42,405.

(The table referred to was marked "Exhibit No. 2461" and is included in the appendix on p. 17326.)

The CHAIRMAN. That is an estimate, you say, Mr. Hook?

Mr. Hook. That is pretty accurate, because it is taken from a figure from our own records of what the men actually produced per man.

In 1940 there were 750 of these mills still in existence.

The CHAIRMAN. Let me interrupt again. You speak about the estimated number of workers. That also comes from your own records?

Mr. Hook. Yes, sir; and checked with other plants. Where do you get that, Mr. Brooks?

Mr. EARL BROOKS (statistician, American Rolling Mill Co). You have reference to those in 1926.

The CHAIRMAN. That is right.

Mr. BROOKS. Those in 1926 are derived by dividing our average production per worker in those units into the total production for the industry.

The CHAIRMAN. Then the figure is derived by a computation.

Mr. BROOKS. That is right.

The CHAIRMAN. And not by a pay-roll check.

Mr. BROOKS. That is true. Through the integration of producing facilities in the steel industry, so far as I know there is no separation of employment by department.

The CHAIRMAN. How do you determine the average production per man?

Mr. HOOK. That was from our own actual records of what the men in the mill produced at that time per annum.

The figure could vary very little from that.

The CHAIRMAN. In other words, we can accept that as substantially accurate.

Mr. HOOK. It is substantially accurate, as accurate as it can be figured. If you take 2,000 off, it wouldn't amount to much.

Mr. HINRICHS. Going back to your first diagram, this 165 gross tons, this picks the steel up in the sheet furnaces—is that right—and carries it forward.

Mr. HOOK. That is where it is produced, yes.

Mr. HINRICHS. So that you got—

DISPLACEMENT OF LABOR

Mr. HOOK (interposing). On that first, that is it. On all the mills of that type in the country, in that department, 42,405 men were required, or were at work at that time in 1926. In 1940, as I say, there are 750 still listed. Approximately half of those mills are still in operation. For instance, on the diagram which you have in front of you, we show the continuous mill displacing the old-style mills, but that actually hasn't happened. We still have in that Middletown plant about 500 men at work on the old-style mills. Part of the work is done on the continuous mills and finished on the old-style mill, because there are certain products which we have not yet been able to make finally on the continuous mill; that is, on the cold reduction mill, and that is true in another plant of ours at Zanesville, Ohio, where the old process, with some improvements in the way of tables and automatic catchers at the back of the mill—is operating pretty much as it did in 1928. It is hand work. So all together, we have over a thousand men in all our plants in the American Rolling Mill Co. I can give you the exact figure. It is over a thousand men still working on old hand mills, 1,036, Mr. Brooks says.

Now, then, assuming, and this is estimating from the number of mills that are still actually operating, we estimate that 27,405—no, 15,000 are still employed in old-style mills, so that the total displacement could not have been more than 27,405. You see, if all those other men have been displaced—

Mr. HINRICHS. (interposing). You speak of those things in operation. This last year has been, in the last months, rather exceptionally active. Are these roughly half, say, 375 hand mills, operating more or less continuously or are these essentially, in large part, stand-by equipment that comes in at a very busy season?

Mr. HOOK. The half, I think, are operating regularly, not just stand-by. You see, there are a number of companies that have no continuous mills at all, that are still operating; for instance, right near us, the Newport Rolling Mill Co. has 22, I think, or 26 old-style mills that are still operating.

Mr. HINRICHS. Some of those mills in the beginning of 1929 were closed down pretty tight, weren't they?

Mr. HOOK. Not the half that I am talking about. Half of the 705, and I should say that of course I haven't the record but I think

that a number of the half that we are admitting that are closed down permanently, were operating in the last half of 1939. In other words, some of the plants who have the continuous mill process weren't able to make all the tonnage that they had orders for on their continuous mills, and they supplemented them with their old hand mills that had been shut down for several years.

Mr. HINRICHS. If you see an assured tonnage of that sort ahead, you build the necessary continuous mills and close down the substantial portion of the balance, don't you? Technically, it is only a limited field that these hand mills that are operating would hold in the industry.

Mr. HOOK. I am perfectly willing to say to you, Mr. Hinrichs, that I think eventually all of the hand mills will go out of existence, because it is not the economical method to use. When we find out how to make these certain products which we still have to make, at least partially, on the old hand mills, and we are hard at work on that, the old hand mill will go out of existence, and it will all be made on the continuous mills. As I say, this was simply to show the general statement that the number of men that were said to have been displaced could not have been.

The CHAIRMAN. I am interested in knowing, Mr. Hook, if you have the figures, which perhaps you have later, how many have been actually displaced.

Mr. HOOK. They haven't. We have increased—

The CHAIRMAN (interposing). You say 27,000 could have been displaced. That is the maximum that could have been displaced.

Mr. HOOK. That's right, to date.

The CHAIRMAN. What has been the actual displacement in that particular department?

Mr. HOOK. It has been increased.

The CHAIRMAN. In that department that we are talking about?

Mr. HOOK. Well, not in that department, but I mean for that operation, the total number of men that are employed in reducing the slab or the billet down to the sheet has been increased.

The CHAIRMAN. You mean—I am not sure I understand yet what you mean by that. I had in mind that there was a displacement so far as that particular work is concerned, within the sheet that we had here, the operations within this sheet.

Mr. HOOK. No.

The CHAIRMAN. The continuous rolling process?

Mr. HOOK. That's right. I don't know just what it is. Have you got that figure? I think we have the Middletown plant. We can show it to you exactly. The fact of the matter is—

The CHAIRMAN (interposing). I got the impression from what has been said here that there was a decrease in the number of employees within that particular area.

Mr. HOOK. In that particular department. I think that is true. I don't know that we have got the exact figures.

Mr. BROOKS. It is very difficult to work up any figures showing the exact amount of displacement which could be applied to any one mill; in other words, the size of the mill, the lay-out of the mill, and certain variations in producing methods might influence that. Also, the size of the hot mill unit replaced would influence it. I can give you a case example, using this Middletown plant, in rough figures.

There were roughly about 1,075 men employed in the area outlined there prior to the adoption of the continuous mill. There are roughly 250 operating men left in that particular area on the mills themselves, doing actual operating work. There are other maintenance men, of course, in addition to the 250.

Mr. HOOK. Well, that is just in the old-style hand mill. There are 500 men in that department still.

Mr. BROOKS. That's right.

Mr. HOOK. In 1929, as I recollect it, the total employment in that particular department was 1,191.

Mr. BROOKS. Discounting the fact that part of those mills are still operating, those two figures would be the relative forces required.

Mr. HOOK. But some of those men have gone over to the strip mill, so that the total number of men in that particular plant in the old department, plus the continuous mill, probably, how many are in the strip mill?

Mr. BROOKS. That is 250 on the hot and cold strip mill.

Mr. HOOK. Well, on the hot mill.

Mr. BROOKS. I don't believe I can tell you off-hand.

Mr. HOOK. You haven't got it. We give you all those figures broken down, but we are going to give you the plant now as a whole. That is what you are interested in, to know whether those men were taken care of in other departments.

Mr. HINRICHS. Was the capacity of the cold sheet mills the same as the capacity of the hot strip mill?

Mr. HOOK. Oh, my, no. Well, I think you didn't catch that. We made 20,000 tons a month on the 22 old hand mills, in a pretty good month, and we made on the hot strip mill as much as 64,000 tons in one month.

Mr. HINRICHS. So that in terms of the relationships of capacity and labor, in that limited segment, the relationship is roughly 1,075 men who could produce 20,000 tons and 250 men who can produce 64,000 tons.

(Representative Williams assumed the chair.)

PRODUCTION IN AMERICAN ROLLING MILL CO.

Mr. HOOK. Pardon me; I think you will see that when we come along, because we give you the output per man-hour, the change in the output per man-hour, which is the thing you are trying to get at.

Now, in the table entitled "Armco Production" is shown the total production of what we call the parent company. That is all of our plants. In 1926 the total production was 431,347 tons; in 1937, 1,203,736 tons, or an increase of 179 percent between 1926 and 1937.

(The table referred to was marked "Exhibit No. 2462" and is included in the appendix on p. 17327.)

Mr. HOOK. In sheets alone we produced in 1926, 428,996 tons, which represented 99.3 percent of the total production of that plant.

In 1937 we had 1,203,736 tons, of which 1,110,414 were sheets. In other words, 92.2 percent of the total production was sheets. The reason we present that picture to you is to show you that the American Rolling Mill Co. is essentially and completely a sheet-producing plant. In other words, there are not a lot of other things involved in these figures with respect to the American Rolling Mill Co., and

this continuous process has to do with the manufacture of sheets and strips only.

Now here we have taken out our Butler, Pa., plant, just to be sure that our figures are very conservative and comparable, covering the same plants. In 1926 we had 431,347 tons and 99 percent was sheets. Now, we took out the Butler plant because it is a continuous mill plant, to throw back the picture into the old parent company; this Butler plant we bought in 1927, so we have thrown it out, so that our figures would be comparable, and even after throwing it out it still shows that 94.8 percent of our total production was sheets, and the increase in tonnage, of course, went from 428,996 to 847,753 in '37, a 97.6 percent increase in those plants that we owned before we took over Butler.

Mr. HINRICHS. I was wondering why the base period of comparison with 1926 was used throughout here; 1937 was a year of very exceptional activity.

Mr. Hook. Correct.

Mr. HINRICHS. 1926 was more nearly average.

Mr. Hook. There was only one continuous mill operating at that time, and that was the American Rolling Mill Co.'s mill at Ashland, Ky., and all these other mills have come in since that time.

Mr. Brooks calls my attention to the fact, and we will show it on another chart later on, that the ingot production in these 2 years was approximately the same—70 percent of capacity.

Mr. Hook. Now the table entitled "Distribution of Armco Sheet Shipments Between Continuous and Hand Mills" is interesting, to show distribution of our shipments as between the hand mills and the continuous mills.

(The table referred to was marked "Exhibit No. 2463" and is included in the appendix on p. 17327.)

Mr. Hook. In 1926, 64.1 percent of the production was rolled on the old hand mills, whereas in 1937, only 28.2 percent was rolled on the old hand mills. Rolled on the continuous mills, in 1926, 35.9 percent; in 1937, 71.8 percent of the production of Armco.

Mr. PIKE. But you still rolled in '37 more actual tonnage on your hand mills than you did in '26.

Mr. Hook. Exactly.

Now, to show that this displacement is going on very gradually, in any event particularly in our plant, remember that we are entirely a sheet plant, but all of that 313,136 tons was partially rolled on the continuous mill. The old bar mill is completely eliminated, but even with that, you see, we made more tonnage on the old hand mills than we did in 1926.

Mr. HINRICHS. Finished more, or made more?

Mr. Hook. We produced more of these green sheets that I was telling you about. In that year we made 274,835 tons and here we made 313,136. That is the finished sheet.

Mr. HINRICHS. What about 1939? Would that show the same sort of picture?

Mr. Hook. In 1939 I think the figure would be approximately the same.

Mr. Brooks. It would be slightly lower, because our total tonnage was lower.

Mr. HOOK. We can give you all that, but I hope you will come out and spend several days there.

Mr. HINRICHS. I shall.

Mr. HOOK. Of course we are talking about employment, and all these things have an effect on the employment. This table, "Armco Parent Company Employment, Average Number of Employees," shows the American Rolling Mill Co. employment. The total employment in 1926 was 6,876; in 1937 it was 13,253, or an increase of 92.7 percent. But again we take out the Butler plant, because you may say it is not fair to include it because that is an entirely new acquisition, so that we go right back to the old company basis, and we have a 51.5 percent increase in the average number of employees for '37 over '26.

(The table referred to was marked "Exhibit No. 2464," and is included in the appendix on p. 17327.)

Mr. HOOK. I think, Mr. Williams, that begins to answer some of the questions that were in your mind.

EMPLOYMENT AND EARNINGS

Mr. HOOK. Now let's see what happened to employment, wages, and hours, in this table "Employment Wages, Hours, and Production, Armco Middletown Plant."

(The table referred to was marked "Exhibit No. 2465," and is included in the appendix on p. 17328.)

Mr. HOOK. This is a rather interesting story, we think. In 1926, the average number of employees at this Middletown plant that produced nothing but sheets, and by the old hand method, was 3,278. In 1937 it was 4,327, or an increase of 32 percent.

Pay roll (wages only)—that is, those who are paid on an hourly basis—in '26 was \$5,125,208; in 1937, \$7,234,256, or an increase of 41.2 percent.

Shipments, 221,382 net tons in 1926; in '37, 403,805, or an increase of 82.4 percent.

Now the question comes to your mind, and I had better answer it before you ask me, "Well now, is that a fair indication of what happened in the industry?" I have to make an admission which we don't like to, and say we did not keep up with the industry, but as compared with that particular plant the increase of the industry was greater than ours. The increase in industry was 82 percent, sheets only.

The man-hours: in 1926, 32.5; in 1937, 19.1, or a reduction in man-hours per net ton of 41.2 percent. Of course we couldn't have got the reduction in price if we couldn't have decreased the cost, which you will see later.

Wage cost per net ton is \$23.15; in 1937, \$17.92, or a reduction of 22.6 percent.

Now let's see what happened to earnings of these men. The minimum wage rate in 1928 was 37 cents, in '37, 62½ cents, or a 68.9 percent increase. The average earnings per hour was 69.8 cents in '26, and 93.6 cents in 1937, or an increase of 34 percent.

I was rather interested in the question that was asked Mr. Ford yesterday (it hasn't anything to do with this) whether, as they had

increased the parts that went into the car, the average skill required was lowered or increased.

Well, the introduction of the continuous mill has increased skilled labor. In other words, there is a greater need for men of increased skill, because we are dealing, for instance, on these continuous strip mills, with measurements of split thousandths. When I was out in the mills as a worker, we thought a one-sixty-fourth fit was pretty good.

Mr. HINRICHs. Your skilled workers in your old mills were your rollers, were they not.

Mr. HOOK. Yes; your roller and your heater were the two men particularly skilled. The other fellows—well, we called them skilled, but it was largely knack. You got into the swing of things, but the roller was really a skilled man.

Mr. HINRICHs. How many rollers would you have had in this layout?

Mr. HOOK. Three times 22.

Mr. HINRICHs. So you would have 66 rollers.

Mr. HOOK. Yes.

Mr. HINRICHs. And at the present time, how many rollers—

Mr. HOOK (interposing). We have 27 at Middletown, in the old plant.

Mr. HINRICHs. But in the new plant, how many men do you have to correspond to your own rollers?

Mr. HOOK. Well, you have a very highly technically developed general foreman, and assistants under him, and your maintenance men have to be more skilled, and then you have your men all along the line, the roll setters and men that do the various jobs. You have an average skill in the continuous mill which is higher than the average skill in the old-style mill.

Mr. HINRICHs. That is, such skilled men as you have that take the place of these 66, have a higher skill now, on the average, than those 66 rollers?

Mr. HOOK. Well, no; I wouldn't say of those 66 rollers, because they were very skilled men. That was a real job.

Mr. HINRICHs. How many men do you have in this mill here [exhibit 2453] who are highly skilled workers? There were 66 rollers in the old process who were a highly skilled group. How many people correspond to them in the new continuous mill?

Mr. HOOK. Every man in that continuous mill is a skilled worker now. I would have to have the force report here, and again, if you come out, we will show you those fellows at work, and then you can see, get this picture.

Acting Chairman WILLIAMS. Is that average earning per hour, shown at 34 percent, largely due to the increased number of skilled workmen that you have acquired on account of this new process?

Mr. HOOK. That has had an influence. That isn't entirely the case; for instance, when we went to the shorter workweek, we increased the average rate per hour, of course, to take care of that change over, but in part, it is due to a higher average skill.

Mr. Brooks calls my attention to the fact that under the old operation we couldn't have sustained, wouldn't have stood for a labor cost of that kind. We couldn't have got enough for the sheets.

Mr. HINRICHs. Part of that increase in average hourly earnings represents a decrease in the proportion of common laborers in your force at the present time, doesn't it?

Mr. Hook. Oh, the common laborer in the mill today is almost eliminated. It is a very small proportion, and when I was in the mill, it was a very large proportion.

Mr. HINRICHs. A third to two-fifths?

Mr. Hook. I would hate to make an estimate. I would be guessing at it, but we could get that together.

Mr. HINRICHs. But it was very high, and now it is virtually limited?

Mr. Hook. Years ago it was a very large proportion of the men.

Mr. HINRICHs. Even in 1926?

Mr. Hook. Of course, by that time, the number of what we call common laborers had been reduced, but proportionately in '26, it was very much higher than, of course, it is in '37 and today.

We have shown a reduction of 21.8 percent in the average hours per week. The average earnings per week have increased from \$32.32 in 1926 to \$33.88 in '37, or an increase of 3.8 percent. And if we adjust for the difference in the cost of living to get real earnings, the real earnings in 1937 were \$38.28 as compared with \$30.99, or an increase of 23½ percent.

Now I think we all agree—and I know you do, of course—that what a man is interested in is, "What can I buy with a day's work?" That is the figure that really counts with him. It isn't the wage rate, necessarily, because it doesn't do a man any good to jump from \$5 a day to \$10 a day if he can't buy more of the things that he wants to buy and use with the \$10 than he could get with the \$5.

ANNUAL EARNINGS OF ARMCO WORKERS

Mr. HINRICHs. He is also interested in what he can buy in the year. What about the regularity of employment?

Mr. Hook. I am glad you asked me that question. In other words, what was the annual earning of these men? We will give you that. These are our figures, actual.

The actual average earning of all the men who worked for wages in 1926 was \$1,685, and for the industry, \$1,627. In 1929, our figure was \$1,605; in the industry, \$1,746. Rather interesting there. We had a drop, and the industry went up.

In 1937, ours was \$1,766; the industry, \$1,630. In 1938, ours was \$1,398; the industry, \$1,203. In 1939, ours was \$1,893, so you can see the advance in annual earnings, and we had made no adjustment, for instance, for 1939, for the difference in cost of living. That would go over \$1,900, of course, well over that.

Dr. ANDERSON. I would like to have you supply, for the average annual earning of \$1,983 in 1939, the average number of employees that received that wage.

Mr. Brooks. That is a total company figure. There was an average of 9,742.

Mr. HINRICHs. That would compare with 4,327 in 1937.

Mr. Hook. That was a single plant.

Dr. ANDERSON. Let's have something that corresponds to the table. What was the average for the Middletown plant at that same time?

Mr. BROOKS. The average for that rate was 3,335. Now those employment figures up above include salary as well as hourly labor.

Dr. ANDERSON. That is total employment in the plant?

Mr. Hook. That is total employment, but the figures from there on down are all wages.

Dr. ANDERSON. What if you squeezed out the salaried group there? What would you have, so as to make it comparable?

Mr. BROOKS. You would have roughly, I would say, about 3,025 in 1926, and in 1937, roughly 4,000. That may not be exact.

Dr. ANDERSON. Would the figure you gave me, 3,335, be correct for 1939?

Mr. BROOKS. That is correct.

Dr. ANDERSON. In other words, a reduction of approximately 700 men. This gain was made in average annual earnings from \$1,766 to \$1,893. The difference was a gain made at the expense of 700 workers?

Mr. Hook. No; you are dealing with averages. That is not the case, Mr. Anderson. For instance, the first three quarters of 1939—it wasn't until the first of September that we got on that high operating rate in 1939, and the average number of workers was reduced as a result of not having as high employment in those periods when we weren't working at the same high rate. The 1937 average rate was higher.

Dr. ANDERSON. What you are saying is that you can't compare annual earnings here, on any basis such as we have just discussed, with the average number of employees for the years indicated.

Mr. Hook. The fact of the matter is that the number of men who worked actually got a certain total pay roll, and if you divide that total number of men who worked into your total pay roll, you get the dollars that they earned.

Dr. ANDERSON. The point I was trying to make was whether there was a difference in the number of men who worked and enjoyed this better circumstance in terms of an annual wage in 1 year as compared with another.

Mr. Hook. Well, we will furnish you with the exact figures.

Mr. BROOKS. At the end of 1939 there were approximately 4,000 people working in that plant, total employment.

Dr. ANDERSON. Of course year-end figures wouldn't suit the purpose either, would they?

Mr. BROOKS. Not for the determination of an annual wage, they would not.

Mr. HINRICHS. As to the method of computing that annual wage, you have divided pay roll by a certain number of employees in arriving at it, is that correct?

Mr. Hook. That is right.

Mr. HINRICHS. And what is the average number of employees that you have taken?

Mr. BROOKS. It is the average of the day-to-day employment in that plant.

Mr. HINRICHS. That means in effect, then, that this average pay roll that you have is the amount which would be earned by a man who worked 365 days of the year, minus Saturdays and Sundays. Is that correct?

Mr. BROOKS. No; that is not correct. It is simply the total wages divided by the average number of workers employed in the plant throughout the entire year.

Mr. HINRICHS. I think you will find, if you check the arithmetic and logic of the thing, that that is effectively the amount which would be earned by a man who worked full time. Just by way of illustration, I recognize the fact that the figures are not strictly comparable and I may have made a mistake in arithmetic, but multiplying the figure of \$33.88 by 52 weeks, my rough calculation is \$1,762 as against your figure of \$1,766. So that these average earnings that you are giving are full-time earnings, and irregularity of employment.—

Mr. BROOKS (interposing). No; the full-time week is 40 hours per week.

Mr. HINRICHS. Yes.

Mr. BROOKS. And we only average 36.2. In other words, we did not average in that plant the full-time hours per week in the industry.

Mr. HINRICHS. You corrected me at one point. It is not full-time in the sense that it is 52 weeks, of 40 hours each.

Mr. BROOKS. That is correct.

Mr. HINRICHS. But it is 52 weeks of work times the average number of hours per week worked by the people in your plant.

Mr. BROOKS. That is right.

Mr. HINRICHS. Now, that does not give the annual earnings, say, of a group of workers who have an irregular employment opportunity, to the extent that there is employment for 2 or 3 months and then no employment. That fluctuating employment has not entered into your average.

Mr. BROOKS. That has entered in. That may represent the average wage of men who worked any place from a week up to the full year. It may range from your minimum wage right up to \$2.50 to \$3 an hour. It is the composite of the entire plant and all the people who worked in it.

Mr. HINRICHS. On an essentially full-time basis.

Mr. BROOKS. Yes; 36.2 hours per week.

Mr. HOOK. When we are talking about the question of displacement of workers, we have got to take into consideration the number of men that were employed in the manufacture and the installation, the building of the plant, and the installation of the machinery. Now this table, entitled "Expenditures for Construction, Armco Middletown Plant," is an exact figure at this Middletown plant. Between '27 and '37, when we introduced the continuous mill in that plant we spent \$20,492,778 actually. In other words, we estimate that the man-years of employment amounted to 9,000, or we employed during that time an average of 819 men at full time at approximately \$7 a day. You have got to take that into consideration when you are talking about displacement, and, by the way, we did use on that construction a number of the men who had formerly worked in the mill when we were running the old style full time.

(The table referred to was marked "Exhibit No. 2466" and is included in the appendix on p. 17328.)

Mr. HINRICHS. Were those \$20,000,000 spent year by year, or did the bulk of it come in a limited period?

Mr. HOOK. The bulk of it came from 1928. Just last year we spent \$3,500,000 of it. No; not of that \$20,000,000, but we did spend that in improving that plant which doesn't show here—\$3,500,000. Between '27 and '37—maybe we have got the figures here to give you, just how it was spent.

In the years '27 to '28, inclusive, there were \$8,059,950; in '29, \$1,512,668; and '30, \$1,050,000; '31, \$280,000; '32, \$210,000; '33, \$341,000; 1934, \$240,000; 1935, \$5,427,094; 1936, \$471,000; 1937, \$1,834,066. And, of course, when you order machinery, the machinery manufacturers start back, and they are ordering supplies, and it follows through quite a period of time before you pay the bill.

Mr. HINRICHS. That, of course, is an extremely important source of employment and we on this committee have been very much interested in the role that construction expenditures and capital expenditures have played in the maintenance of the level of business activity. But essentially those expenditures, as I listened to them, were made in 2, or possibly 3, years. The first figure that I recall is a figure of roughly \$9,500,000, I believe; then a figure of \$5,400,000; and then a figure of something over \$1,000,000. The employment that was created by this activity was a concentrated employment that occurred in those years. From our point of view, looking at the economy as a whole, it is a very important source of employment if it is continuous, if in 1 year it is being done in Armco, and in another year it is being done in another company, and so forth.

It isn't that 819 would not be comparable to the figure of 1,075 men in your hand mills. Those 1,075, barring business fluctuations, are employed more or less continuously. Those 9,000 people work roughly a year or two, or at the most 3 years, on an extensive basis. At that time the employment was even greater than 9,000. At other times Armco's activities—there is no criticism implied—were not giving rise to the employment of these particular individuals. They couldn't.

Mr. HOOK. Of course, you are correct to a very large extent, but this shows when we paid the bills. Now, as you know, lots of times you wait until the installation was complete, you hold back a certain amount. It has been going on more gradually than your expenditure shows. For instance, in 1935, the order was probably given for a lot of it a year before, and the work in those equipment plants was going on, and finally concentrated with a lot of bills very suddenly. If you ask our treasurer, he will tell you about it.

(Senator O'Mahoney resumed the chair.)

Mr. HOOK. This table entitled "Armco Average Iron and Steel Sheet Selling Prices," is interesting only in one respect. Of course, I discussed the question of price before this committee last November, and these same figures were presented to you, except we didn't have the 1939 figures at that time, naturally. And it is simply presented here to show that, starting back when the first continuous mill was in operation, you see the big jump in the average realized price that we received for all the sheets—what we received for what we shipped. In 1923 it was \$100.15, going right on down, of course, in that very depressed period of 1933, and before we had that big increase in wage costs, it got down to approximately \$46; in 1937, \$64.50; in 1939, \$57.31.

(The table referred to was marked "Exhibit No. 2467" and is included in the appendix on p. 17328.)

Mr. Hook. That very great reduction in the price of the product, of course, encouraged the use, and is responsible to some extent—we don't claim it all—for the increased production which we showed you before in our Middletown sheet-production plant; is responsible for helping to increase the production which we sold, which meant more employment for the men in the mills.

CHANGE IN QUALITY OF STEEL

Mr. Hook. In addition to the fact that we gave them the sheet at a very much lower price, the interesting thing is the difference in quality. For instance, I have here, and I can pick it up with one hand, the old Ford fender. Mr. Chairman, when I started—

The CHAIRMAN (interposing). It is interesting how much of this testimony revolves around Ford and the Ford car.

Mr. Hook. It does, doesn't it?

The CHAIRMAN. Of course, Mr. Ford was the pioneer in the mass-production field.

Mr. Hook. Well, in 1911 and 1912, we started to make what we called a high-finish sheet, and when we look at our present-day sheet, it was a pretty rough piece of work. I traveled to Detroit a great deal during those days trying to help find out what we had to do to a sheet to make it useful. We put as high as 16 and 17 coats of paint on that sheet in those early days.

This is the model T Ford fender. I don't know how many coats that has on there, but if you could look at that sheet you could see right through the paint how imperfect the surface was. Then look at this big sheet I am going to show you now, which is a modern Buick fender sheet. This sheet sold in 1923 for \$135 a ton, and for that sheet last year the market price, if they got the market price—they didn't always get it, as you know—was \$62 a ton.

The CHAIRMAN. How much larger is that sheet than this?

Mr. Hook. This fender is made up of two pieces.

The CHAIRMAN. But the prices that you are quoting are per-ton prices.

Mr. Hook. That is correct.

The CHAIRMAN. This modern \$62-a-ton sheet is how much better than the old sheet?

Mr. Hook. Well, Senator, there wasn't any process that the steel industry knew anything about, under the old hand-mill process, by which we could produce a sheet to make that part. That is stamped out of one piece, in one operation. I can pick the Ford fender up and run all over with it. I can't do it with the new one.

In other words, if we had attempted to make one like the Buick fender in the day of the old one, I don't know whether, because I am neither a pressman nor an automobile producer, they could have done it, even if they had tried six or seven parts.

The CHAIRMAN. How many parts are in the old one?

Mr. Hook. Two in this, and you can see what it is. That is the Ford.

Now, over here I have an old Dodge fender. I could pick this up and run away with it, too. You can see from there, I think, the weld. That is probably a repair, but right here is where they were joined. Even that fender had to be made out of two pieces, and I don't know whether you can see this bulge, Senator, but right here there is a kind of bulge which was put into the fender to give it strength, and when I was out in the mill trying to develop this better sheet we ran into trouble. We used to call it "corn meal" structure. In other words, we just couldn't get a surface fine enough, smooth enough, so that the imperfections wouldn't show through on three or four operations. We just couldn't have put only two coats of Duco on this sheet. You wouldn't have had it. Nobody would have run the car. It was a horrible mess.

The CHAIRMAN. This is most interesting testimony, and it is obvious that we are not going to be able to finish in any reasonable time now, so if there is no objection I think the committee may recess until 2:15 o'clock, and if you will be good enough to come back this afternoon we will proceed.

Mr. Hook. I am delighted. I am at your service.

The CHAIRMAN. If there is no objection, the committee will stand in recess until 2:15.

(Whereupon, at 12:15 o'clock, a recess was taken until 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:35 o'clock, upon the expiration of the recess, Senator O'Mahoney presiding.

The CHAIRMAN. The committee will please come to order. You may proceed, Mr. Hook.

Just before we recessed, Mr. Hook, you were illustrating the two fenders. One was the old Ford fender. What was the price per ton of that sheet of steel? I have forgotten what price you gave.

Mr. Hook. Back in 1923, before the continuous mill came into existence, that sheet sold for \$135 a ton.

The CHAIRMAN. And the present price for the other sheet is \$60 a ton?

Mr. Hook. \$62.

The CHAIRMAN. Do you know how much steel is now used in fenders as compared with the amount in 1923?

Mr. Hook. Well, I can't answer that exactly, Senator. If you look at that old fender there, and look at this one, you have to make the best estimate you can. I haven't the relative weights.

The CHAIRMAN. The reason I asked the question is, this noon I happened to meet Mr. Kettering, and told him of your interesting testimony this morning, and he said, as I recall it, that in his opinion the automobiles now use at least twice as much steel as they did in 1923.

Mr. Hook. I think that is probably true. We figure about 1,400 pounds. We have a chart showing that for the automobile industry, but it does not show the weight for the car. We have that at home; I'm sorry. I tried to think of all the things you might ask for.

The CHAIRMAN. Oh, yes; that is impossible.

Mr. Hook. I will be delighted to send that to you, because we have got it.

DECLINE IN SHEET STEEL PRICES

Dr. ANDERSON. Mr. Hook, I wanted to ask you a question while we are on this topic of the decline of iron and steel selling prices in your plant. Would that be representative of the industry, in your mind, or not?

Mr. HOOK. Yes; for that product.

Dr. ANDERSON. For that particular product?

Mr. HOOK. Yes; that is, for sheets.

Dr. ANDERSON. Let me ask this question, then. Is this to be taken as the decline in steel sheet selling prices only?

Mr. HOOK. That's right.

Dr. ANDERSON. In other words, you have isolated, out of all the products of your plant, steel sheets, and we are comparing identically the same product all the way through.

Mr. HOOK. That's right.

Dr. ANDERSON. That is not a decline, then, in prices of your products, whatever they might be?

Mr. HOOK. Not the others; but, of course, sheets, as we showed you this morning, are over 90 percent, the lowest percentage of any one plant being about 92 percent sheets.

Dr. ANDERSON. But we are only concerned here with sheets.

Mr. HOOK. That's right. In other words, the product that is made on the continuous mill.

Mr. O'CONNELL. May I ask a question there? Speaking generally, Mr. Hook, as I recall the testimony in the other hearing we had on steel,¹ a picture of the price of steel products generally over a comparable period would be quite different from that, would it not?

Mr. HOOK. You are correct.

Mr. O'CONNELL. There has been a relatively greater decline in the price of sheets than in almost any other steel product?

Mr. HOOK. Correct.

Mr. O'CONNELL. To what do you attribute that?

Mr. HOOK. That is the technological development, the introduction of the continuous sheet mill. Not only that, as we tried to say in our opening remarks; we don't credit that drop entirely to the installation of this innovation, because management efficiency and other things that we tried to enumerate did have a part in that.

Mr. O'CONNELL. I understood you to indicate this morning that, as far as this product is concerned, it was somewhat more responsive to price reductions in terms of the volume than some other steel products?

Mr. HOOK. Decidedly so.

Mr. O'CONNELL. There has been apparently quite some controversy among people who do some thinking on the subject, as to how elastic the demand for steel is, and from what you say this morning, I take it that it is your belief that for this particular steel product the demand is to a greater extent responsive to price changes than in some of the other steel products.

Mr. HOOK. Yes. You see there was technological development with respect to other products in earlier years, from, say, 1910 to 1920. There were developments of the continuous mill for rolling sheet

¹ See Hearings, Part 19.

bars. For instance, when I started to work in our little plant at Middletown we made sheet bars, first on an old two-high break-down mill with three-high finishing mill with a lot of passes and the men did a lot of very hard physical work. That was supplanted by what is known as the continuous Morgan sheet bar mill, and that development came in, I forget when. Mr. Eppelsheimer, perhaps you remember.

Mr. EPPELSHEIMER. About 1900.

Mr. HOOK. It was about 1900 that the Morgan mill was developed, so there was a lot of change in the price of other products, the sheets having gone on for many, many years by this old method until we found a way of doing it continuously.

Mr. O'CONNELL. Speaking generally, are sheets ordinarily sold to a few large buyers as distinguished from a lot of smaller buyers?

Mr. HOOK. No; we have a chart showing the distribution of the product to the various industries.

Mr. O'CONNELL. I will be interested in that.

Dr. ANDERSON. May I refer, in this matter of prices, to the statement that you submitted to the committee, on page 5, the fourth paragraph down, we have this statement:

Steel users not only have benefited from improved quality which makes for possible lower fabrication costs, but they have also enjoyed the advantage of lower prices as well.

Then you take from 1926 to 1939, "the average price of all iron and steel sheets realized by our company declined 31 percent."

I take it that is this illustration here, and we are dealing with steel sheets only.

Mr. HOOK. That is right.

In this table, entitled "Iron and steel industry (blast furnaces, steel works, and rolling mills) employment, wages, and production," we jump from the pure sheet plant and use the American Rolling Mill Co. because we developed this continuous process. We make practically nothing but sheets. We will see what the effect on the entire iron and steel industry has been, because in this chart and others I think that will be obvious.

(The table referred to was marked "Exhibit No. 2468" and is included in the appendix on p. 17328.)

Mr. HOOK. Now, we have taken the iron and steel industry, blast furnaces, steel works, and rolling mills, and we show employment, wages, and production. The reason we use 1925 in this instance and '26 before is because here we are using the United States census figures. This is a census year. I thought I had better explain that right off the bat.

The average number of wage earners in '25 was 399,914; in '37, 502,417, or a 25.6-percent increase, during which time the population, as I noted in my preliminary statement, increased 11.2 percent.

The pay roll, which is wages only, not salaried workers, increased from \$660,297,150 to \$817,777,929, or an increase of 23.8 percent.

The steel production—this is steel ingots—increased from 45,119,113 tons in '25 to 51,599,000 in '37, or a 14.4 percent increase.

The CHAIRMAN. Mr. HOOK, do those figures with respect to pay roll and wage earners indicate that the rate of wages has not increased?

Mr. HOOK. We will have that down below, Senator. Down here we have the average earnings per hour.

The CHAIRMAN. All right, I will wait until then.

Mr. Hook. We will come to that.

The man-hours per gross ton of steel—that is all rolled products—are 23.12 in 1925 and 19.53 in 1937, or a reduction of man-hours per gross ton of product of 16.2 percent.

The labor cost per gross ton of steel increased from \$14.68 to \$15.85, or an increase of 8 percent.

You remember we showed you that in the sheet mills operating in our own plant, with the continuous process of production, we had a decrease in labor cost per gross ton, but taking the industry as a whole, there was an increase in the labor cost.

Now, had we not introduced the continuous mills, and had not the sheets and strips represented such an important part of this total steel production of 51,000,000 there, then this increase would have been considerably more.

The CHAIRMAN. This is the curious thing that suggests itself to my mind. The percentage increase of wages is less than the percentage increase of the number of wage earners, and yet the labor cost per ton has increased. How do you explain that?

Mr. Hook. The shorter hours. You see the average workweek in 1925 was 50 hours, whereas in 1937 it was 38, so we had a reduction in the number of hours that the men worked of 23.6 percent. That accounts, too, for a large part, if not all, of the increase here of the average number of wage earners.

The CHAIRMAN. That is, the reduction in the number of hours resulted in an increase in the number of wage earners.

Mr. Hook. Correct.

The CHAIRMAN. And do you think that was the cause of practically all of the increase in the number of wage earners?

Mr. Hook. We have the exact figures. It covers practically all of them—not in our case; now we are talking about the industry.

Dr. ANDERSON. Might I ask a question concerning that labor cost per gross ton of steel? What is the source for such a figure? How do you get at such a figure?

Mr. BROOKS. That is simply the steel production and the wage figure.

Dr. ANDERSON. You computed it from the available data there? We don't have any source for any such thing as that for the industry.

Mr. BROOKS. You could take it out of the Biennial Census of Manufactures. Those figures are shown.

PROPOSED REDUCTION IN HOURS

The CHAIRMAN. May I ask, Mr. Hook, how do you look upon the suggestion, which is sometimes made, that increased employment could be provided by a further reduction of the number of hours which each worker would be permitted to work?

How do you look upon that suggestion?

Mr. Hook. Well, I don't look on that favorably, because I think we have reached a point now where, with an average production—well, say you get 70 percent—in order to keep their earnings up per week and per annum you would have to have a considerable increase in the wages, in the hourly rate, and I don't—

The CHAIRMAN (interposing). What is the average week in the iron and steel industry now? Is it 40 hours?

Mr. HOOK. Yes; 40 hours. Over and above 40 hours is time and a half.

The CHAIRMAN. So what you are saying to us is that if, for example, the workweek were reduced to 30 hours, such an increase of the hourly rate would be needed to enable the worker to obtain the same income that he receives for a 40-hour week as to be uneconomic as far as the industry is concerned.

Mr. HOOK. That is my opinion, Senator; and I think you would reduce the use of the product upon which they are dependent for their work.

The CHAIRMAN. In what way?

Mr. HOOK. By increasing the cost to a point where you would begin to seriously affect its use.

The CHAIRMAN. Of course, the 40-hour week in itself was resisted by industry, looking at it as a whole. Every shortening of the workday and the workweek has been resisted as this movement has gone along from year to year. That is true, isn't it?

Mr. HOOK. Well, speaking for the steel industry, that was a voluntary act.

The CHAIRMAN. Yes, in this case; but I am now going back many years. In the steel industry at one time the 12-hour day was rather common, was it not?

Mr. HOOK. Yes, indeed.

The CHAIRMAN. And it was some struggle before that was abandoned.

Mr. HOOK. You are correct.

The CHAIRMAN. Now, what do you think is the minimum workweek that would be economic in the industry?

Mr. HOOK. I think we have reached the very minimum now, Senator. I think it would be a very serious matter to attempt to go any further.

The CHAIRMAN. Because of the increases in cost that would result to the consumer; is that the idea?

Mr. HOOK. It is bound to do that.

The CHAIRMAN. And, therefore, in cutting down the market for the product.

Mr. HOOK. I think so. I think you would limit the uses in many instances.

The CHAIRMAN. Do you see any argument against those conclusions? Is there another side to it, in other words, as you look at it?

Mr. HOOK. No; I think I see only the side that I am favorable to, I am afraid, Senator.

The CHAIRMAN. I guess that is the way with most of us.

Mr. HOOK. That is quite a study, though. I appeared before the National Industrial Recovery Board when Mr. Clay Williams was chairman, Senator, and I think my detailed testimony on the 30-hour week is a matter of record some place here in the Government files. With the break-down, which I haven't here to substantiate my position, I think we presented pretty conclusive evidence that it would be a very serious mistake to attempt to go to a 30-hour week.¹

¹ See *Employment Provisions in Codes of Fair Competition*, National Recovery Administration, January 31, 1935, Volume 2, Part I, pp. 767-804.

LABOR COSTS FOR STEEL PRODUCTION

Mr. HINRICHS. Mr. Hook, this morning you indicated that in the Armco plant the labor cost for sheets in 1926 was about \$23.15. I presume that the cost in 1925 would have been about the same?

Mr. HOOK. Yes.

Mr. HINRICHS. Now, the labor cost per gross ton of steel that you show on this chart is an average for the entire industry, \$14.67.

Mr. HOOK. That's right.

Mr. HINRICHS. Sheets had a very much higher labor cost?

Mr. HOOK. Pardon?

Mr. HINRICHS. Sheets had a substantially higher labor cost?

Mr. HOOK. Yes.

Mr. HINRICHS. It follows, therefore, with other products which had a substantially lower labor cost per ton, which I suppose would have been the heavier steel roll products?

Mr. HOOK. For instance, if you look at your diagram that you have in front of you which I used this morning, "Exhibit No. 2453," to show a steel plant manufacturing sheets, sheet bars stopped before you started in the old-style hand mills.

Mr. HINRICHS. I am not criticizing the higher price of sheets. I am criticizing this lower figure here, in terms of the significance of the change from \$14.67 to \$15.85; during this period between 1925 and 1937, the composition of the steel products going to make up those 45,000,000 and 51,000,000 tons has changed quite drastically. Sheets, you indicated this morning, had increased from some 6,000,000 to some 10,000,000 tons. Structural steel shapes, on the other hand, are less. Steel rails, I believe, would be less.

Mr. HOOK. Yes.

Mr. HINRICHS. So that the high-cost items, or let me put it the other way, the items with a high labor content and high labor costs in the steel industry, have been increasing between 1925 and 1937.

Mr. HOOK. Can I interrupt?

Mr. HINRICHS. And the low-labor costs and the low-labor-content items have been decreasing?

Mr. HOOK. May I interrupt you just a second?

Mr. HINRICHS. Yes.

Mr. HOOK. This figure is on steel ingots, which is the beginning of the operation before you begin to roll. These rails and everything else are made from that, and this labor cost is based on the first beginning of rolling; that is, before you start to roll the steel ingots.

Mr. HINRICHS. Your pay-roll figure is the census pay-roll figure, I believe?

Mr. HOOK. That's right.

Mr. HINRICHS. The census pay-roll figure covers—

Mr. HOOK (interposing). Everything.

Mr. HINRICHS. The pay rolls in blast furnaces, steel works, and rolling mills?

Mr. HOOK. Correct.

Mr. HINRICHS. And would include the pay rolls of the final rolling process, sheet pay rolls, for example? Your ingot figures are comparable figures, I presume. I don't remember the figures, but I am sure they are.

Mr. BROOKS. No, they are not, Mr. Hinrichs. Our labor costs per ton were based on finished sheets. If we had used ingot production, it would have come out lower on both ends. In other words, the 1926 figure would have been lower, and the 1937 figure would have been lower, but the relationship would have been somewhat the same.

Mr. HINRICHs. You mean to say that these labor-cost figures are specially weighted by the different rolled products? Let me ask my question in another way. If you had had this same proportion of heavy-rolled products in 1937, with reference to the 51,000,000, as in 1925, and the same proportion of light-rolled products, that figure of \$15.85 would have been smaller than the one that you have there. I don't know how much.

Mr. BROOKS. Yes; it might have been.

Mr. HINRICHs. It would have been?

Mr. BROOKS. Yes; I believe it is true that it would have been.

Mr. HINRICHs. Now that same criticism, then, applies to this 23.12 and 18.38 man-hours.

Mr. BROOKS. Correct.

Mr. HINRICHs. Those are the number of man-hours required to produce a gross ton of steel, but the steel that you are talking about is of a changing composition. It is a finer product, so that if you are trying to report the technological development as it has affected man-hours of labor, the figure that you gave this morning of a decrease from 32½ to 19.1 is a very accurate picture for sheets.

Mr. BROOKS. Sheets alone.

Mr. HINRICHs. And we don't have the same figure before us now for the steel industry as a whole, or for any other steel product.

Mr. HOOK. That is correct. You have an indicator.

Mr. HINRICHs. Rather crude! [Laughter.]

Dr. ANDERSON. The question that follows naturally from Mr. Hinrichs' question to you is whether you propose to use this to make a comparison of unlike things, this compared with your previous statement in the morning, with respect to steel sheets?

Mr. HOOK. Well, it is the best comparison that you can make with the available information that you have.

Dr. ANDERSON. In other words, at the outset, you'd say it would be a very crude comparison.

Mr. HOOK. Well, maybe we ought to admit that, that it is a crude comparison, but it is a comparison, and there has been an increase, and of course, if the relationship of the finished products in 1937 is the same as the relationship between the various finished products in 1925, then that is an accurate statement. Now just what the change in relationship has been—

Mr. PIKE (interposing). It is not inaccurate to say that the pay rolls have gone up? It is not inaccurate insofar as the wages are concerned. Some of the deductions from it may be quite inaccurate as to the gross ton of steel, if the composition has changed a great deal, but from the point of view of wage warnings, pay roll, those figures are accurate, aren't they, in the steel business?

Mr. HOOK. My attention is called to the fact that the Brookings Institution have used the same basis of figures.

Dr. ANDERSON. That is true of the Brookings Institution. I have the form in that book, but it is definitely dealing with the problem only of blast furnaces, steel works, and rolling mills. They make it that

sort of a tabular display, but they are not trying to make any comparison between it and over-all, and any part of the industry that might be included in it.

Mr. HOOK. I'm not trying—

Dr. ANDERSON (interposing). In other words, you are just submitting this as an evidence of what is occurring in these things in the over-all.

Mr. HOOK. Yes. The best figures that we could get from Brookings Institution, but it shows what has happened in the iron and steel industry in 1925 to '37 inclusive.

Dr. ANDERSON. Let me just make one comment, and ask a question that arises from it, if that is what this is supposed to show. You are taking 2 years, 1925 and 1937, and making a comparison between them, and saying that that is a trend of what has occurred between 1925 and 1937. Is that right?

Mr. HOOK. That is correct.

Dr. ANDERSON. Might I point out that I don't believe any statistical procedure would permit you to draw such a conclusion, because you have two end points only and you don't establish a trend thereby. All you have done is compare one year, 1925, and another year, 1937.

What has occurred between might be quite contrary to anything that is displayed in the last column of percentage of change; in the table from which you quoted, that is precisely drawn out. If you had taken 1938 as your end year, you'd have shown a quite different picture, or if you had selected any other base year than 1925, you'd have shown a different picture.

Mr. HOOK. Well, you know why we took this period of 1926 to 1937, in this case, 1935. It is because, between those periods, the continuous mill came into operation and it has had its effect.

Dr. ANDERSON. I tried to make the point earlier, Mr. Hook, that what we were dealing with was a single display here, and it wasn't purporting to show what did occur in the continuous sheet-mill process. In other words, to use this as an evidence of what might have occurred in your part of the industry wouldn't be reasonable because this course includes it and many other factors. It is an inclusive set of data and not one that is detailed enough to permit such comparisons.

Mr. HOOK. Well, it does show the trend within those periods, unquestionably.

Dr. ANDERSON. As a matter of fact, my point is, Mr. Hook, that you can't establish a trend by comparing 2 years. I will give you a good example of it. I just happen to have it, because of a piece of work that I have done recently. If you take agricultural gainful workers in the United States from 1870 to 1930, you establish the fact that their number has increased 77 percent.

But if you spot the intervening census periods you find that by 1910 the peak has been reached, and that by 1930 there was an actual decline in numbers from 1900. In other words, you had a broken trend-line. The figure for 1870 was lower than 1930, but it rose from 1870 to 1910, and then dropped off to 1930. That is a trend; you don't compare 1870 and 1930 and think you have a trend, just as you don't compare 1925 and 1937 and establish thereby a trend. You have to put in every intervening year. Isn't that correct?

Mr. HOOK. Let's take this. Let's be really practical. There is no question but that is what happened so far as pay roll is concerned, so if everything else is out the window the industry did increase its pay roll from 1925 to 1937 by 23.8 percent.

Dr. ANDERSON. Might I just question something at that point. Now we will put in different years and see what happened. Based on an index, 1923-25 equals 100, 1925 stood at 99, according to the Brookings figures. This is total wages paid. In 1937 the figure stood at 122.5. Put the next year in, and you have 1938 standing at 68, or decidedly below 1925. You would thereby have a decided drop in total wages paid if you used 1938.

Mr. EPPELSHEIMER. What page is that?

Dr. ANDERSON. Page 299.

Mr. HOOK. They weren't comparable in operating rate. Let's put in 1939. Maybe we should have put in 1939. We will prepare a chart for you and send it back.

Dr. ANDERSON. That is right; I think any trends would require just such a procedure.

Mr. HOOK. All right; we will be glad to present and get some facts in for 1939.

The CHAIRMAN. What is the general trend as you know it? Is it up or down?

Mr. HOOK. Wages have been up. We can see that.

Mr. HINRICHS. I am sorry; I have just one more question on that chart. As I put those figures together, there is another figure which you could have used here, which was the total number of man-hours worked in the industry. You show an increase of roughly 400,000 to 500,000 workers. Then you show average hours per week on the second line of the second half of your chart.

Mr. HOOK. I think maybe we have those figures; we will see.

Mr. HINRICHS. Multiplying those two, you get figures of roughly 2,000,000,000 man-hours per week in 1925, and 1,917,000,000 man-hours—I have my decimal point wrong—in 1937.

Mr. BROOKS. I have the calculated figures.

Mr. HINRICHS. Would you include them, please?

Mr. BROOKS. The man-hours were 1,043,000,000 in 1925, and have been reduced to 99,728,000 in '37.

Mr. HINRICHS. So that the maintenance of the employment figure between 1925 and 1937 depended in very large part upon that decrease in hours per week that you show on the bottom of the chart.

Mr. BROOKS. Yes. But the sheet-producing unit, the American Rolling Mill Co., was up in man-hours. That is the point. We are talking about technological development, and where that technological development affected a plant making that product, the man-hours went up, and later on you will see some figures here that will, I think, enlighten you and you won't worry so much about that chart.

Mr. HOOK. The table entitled "Iron and steel industry, increase in sheet and tin-plate production" shows the increase in sheet and tin-plate production in the iron and steel industry. In 1926 the total hot-rolled products, 35,495,892; hot-rolled products and sheet and tin plate, 29,168,018; or in 1926 there were 6,327,874 tons of sheet and tin plate. In 1937 the total hot-rolled products amounted to 36,766,380.

a 3.6 percent increase in this period. The hot-rolled products other than sheet and tin plate went down to 25,972,079, or a decrease of 11 percent in the products other than sheets.

(The table referred to was marked "Exhibit No. 2469" and is included in the appendix on p. 17329.)

Mr. HOOK. The sheet and tinplate alone went up to 10,793,592, or an increase of 70.6 percent in the particular end of the industry where this technological development was introduced. Or there was an increase in sheet and tinplate between those periods of 4,465,718 gross tons, and we figure that that is equal to giving employment to 45,000 men.

Now, I think that is very enlightening and gives you—

Dr. ANDERSON (interposing). Mr. Hook, might I ask you now, if you did splice on the successive years, has that been a continuous trend? Increase in sheet and tinplate has been moving up since '37 as well?

Mr. HOOK. I don't know whether we have the figures, so I couldn't say definitely that that is true. I don't think that progression has kept up.

Dr. ANDERSON. That 10,000,000 tons is not a peak that represents that artificially high year of '37?

Mr. HOOK. No; '39 would show about the same as '37.

Dr. ANDERSON. It has held after that?

Mr. HOOK. For instance, in our own case I will give you the exact figures and I think we ran right along with the industry. I don't think we are any smarter than the rest of them, and in 1937 our shipments were 1,131,000; in '39, 1,033,000, so it kept up pretty much the same.

Dr. ANDERSON. If that is true then you would say that your part of the entire steel industry is even more important today than in 1937, because the indices for total output have dropped in '38; and I suppose they are still down in '39. In other words, this would be accentuated by later figures.

Mr. BROOKS. I can answer your original question. In 1938, which is the latest break-down of figures we have, sheets were 35.8 percent of the total hot-rolled production, which is a greater percentage, I believe, than is shown in '37, when it was 29.4 percent of the total.

Dr. ANDERSON. So that is really true; it is increasing.

Mr. HOOK. It is increasing.

Dr. ANDERSON. And you would say now that sheets have become a predominant factor in the industry, making for whatever prosperity the industry shows?

Mr. HOOK. It is a very important factor in it, that is so, almost the dominant factor.

Mr. HINRICHS. Mr. Hook, you spoke, I think, of an increase of employment of 45,000. Did I hear you correctly?

Mr. HOOK. This 4,465,718 we just estimated is equal to an increase of—

Mr. HINRICHS (interposing). Forty-five thousand people?

Mr. HOOK. Forty-five thousand men all the way through.

Mr. HINRICHS. Turning to Exhibit 2461 presented this morning, an estimate of the number of workers employed in the industry in the hand-mill processes, there is a line on it, "Estimated number of

workers (sheets), 4,237,847," approximately the same figure that you have there—slightly smaller, and an estimated employment of 25,682.

Mr. HOOK. In that department alone. We have taken credit here for the employment all the way through in all the departments, not just—

Mr. HINRICHs (interposing). This is only in the mill, and stops at the strip pickler, which didn't exist, I take it?

Mr. HOOK. It is right in that group where the continuous mill was installed to take place of the old hand mill.

Mr. HINRICHs. And this thing includes the process all the way through to the railroad car?

Mr. HOOK. That is, of course, an estimate.

Senator KING. Mr. Hook, I would like to ask one question. I know that many of the witnesses who come here don't expect all the members of the committee to be here all the time, because we have other committees. I have been in other committees all day, and I am sorry when we don't have the opportunity to be here all the time to listen to you, but we will read all that is said by the witnesses who appear.

I want to ask you whether or not you are familiar with the testimony that has been given by Mr. Fairless and other respecting the development, and production, and changes in the steel industry.¹

Mr. HOOK. Fairly so, Senator.

Senator KING. Would you say that your testimony with respect to the figures which they gave as to production and employment, and so on, are substantially in harmony with those, or materially different?

Mr. HOOK. I should think they ought to coincide.

Senator KING. I wondered if you made an examination to see whether there were any coincidences or any divergences.

Mr. HOOK. I think we went through those figures fairly well, the Steel Corporation figures, and so far as I know there were no inconsistencies with respect to our figures.

Senator KING. I might add that I was present during the testimony of many of the witnesses concerning the steel production, and I am reasonably familiar with their testimony, and I am not familiar with yours because of being compelled to be in other committees today.

Mr. HOOK. That was my bad luck.

CAUSES OF INCREASED VOLUME

Mr. HINRICHs. You do very definitely connect this increase of \$4,465,000 with the decrease in your selling price from \$100 to \$57?

Mr. HOOK. Oh, yes.

Mr. HINRICHs. And we can assume that the earlier witnesses would probably indicate that there was an important relation between price and volume.

Mr. HOOK. Remember, Mr. Hinrichs, we didn't take credit for the increased volume entirely due to the price change, but to the increased quality of the product which made possible a thing of that kind that couldn't be made before.

¹ See Hearings, Parts 18, 19, 20, 26, and 27.

Mr. HINRICHS. That is, if you didn't have a better product, it couldn't have been used, but it was highly desirable in your opinion to have lower prices in order to get volume use.

Mr. HOOK. We are perfectly willing to admit that competition as other mills came in had something to do with lowering the price, because the return on the investment hasn't been what I think it should have been.

Dr. ANDERSON. But is it not the lower price that makes it possible to use the larger thing instead of the little thing that used to be used? (Referring to the fenders on exhibit before the committee.)

Mr. HOOK. Undoubtedly.

Dr. ANDERSON. In other words, when steel approaches the consumer's market, steel has to be concerned about lower prices, or as low prices as possible.

Mr. HOOK. Yes; that is what we are working for, to find ways and means of decreasing the cost of the product to make it available for larger use.

There was a question asked this morning and I think this table, "Distribution of sheet and tin plate production to consuming industries," will show it. Iron Age is the source of our information. Mr. Brooks reminds me that these totals down here don't agree with the totals which we have used, probably because they are obtained in a different way and they are distributed, but it is approximately the same. The distribution is probably fairly accurate, and this table is only presented to show the increased use of sheet and tin plate in these industries.

(The table referred to was marked "Exhibit No. 2470" and is included in the appendix on p. 17329.)

Mr. HOOK. In the automotive industry it increased 142.9 percent in that period; agriculture, 95.7. This is very enlightening—there was a reduction of 27.2 percent in the construction field—and in the export field, an increase of 68.1.

Jobbers and warehouses, an increase of 170. To those of us in the industry that is a very interesting and significant figure, because jobbers sell to the very small manufacturer and to the tinner and to the man who is making repairs, and that is a very encouraging increase to us.

The CHAIRMAN. You interpret that to mean that there has been a very remarkable increase in the consuming power for this product of small independent products of one kind or another?

Mr. HOOK. Apparently. That is what is indicated to us.

The CHAIRMAN. Is that the fact from your experience?

Mr. HOOK. Yes; it is.

The CHAIRMAN. To what do you attribute that increase?

Mr. HOOK. Well, I say the question of price and quality both come in there.

The CHAIRMAN. No; I mean how does it happen that there are more users, more small users of sheet and tin-plate? What do they use it for?

Mr. HOOK. Oh, there are innumerable purposes. Senator. For instance, there are little gadgets that are now made out of sheet steel, and this little manufacturer who only uses a few tons, can't buy by the carload, goes to the jobber and buys.

The CHAIRMAN. What does this little manufacturer do with the steel plate? And there any new industries, new products?

Mr. Hook. He will stamp it out into articles of various kinds, maybe an ash tray. This one is made out of glass, of course, but we are trying to get him to make it out of steel.

Senator KING. The ingenuity of man manifests itself in different uses to which steel products may be put, as well as in the plastics and glass, and the other products.

Mr. Hook. That is right.

The CHAIRMAN. These new uses are being developed by small manufacturers, independent enterprises?

Mr. Hook. Yes.

The CHAIRMAN. And not by the large enterprises?

Mr. Hook. Yes. For instance, Senator, I think I called your attention in November to a very unique product which we have developed and put on the market in the last 2 years, known as zinc grip, and the continuous mill made that possible in part, only, but it is a method of galvanizing sheets, that is putting a spelter coat on them, so that that coated sheet can be put in a press and stamped out without that spelter breaking off.

Now formerly, you would have to take a black sheet and stamp it, because the spelter or the zinc wouldn't stick on it, and then you would pickle that sheet and then put it in a hand-dipped operation, which was very expensive. It took a great deal of spelter.

So now the man with a sheet which only costs \$2 a ton at the present time above the price of ordinary common galvanized sheets, can stamp these articles out at very much less cost to him. Therefore, it is increasing the use of the material and makes it possible for him to sell his product at a lower price and create a wider market.

This is simply a break-down.

Dr. ANDERSON. Mr. Hook, I am curious to know because of the great importance of the construction industry and its prosperity to the prosperity of the Nation and the reduction of unemployment, why you have the construction industry there in the red with a decline in use of steel and tinplate.

Mr. Hook. Of course, there are two reasons for that, in my opinion. The prime and important reason has been that the flow of private and corporate savings into the capital goods industry has been retarded, and I think that is one of the very important things.

Then I think that the construction industry, certain parts of the construction industry—and when we are talking about construction we must differentiate between the big construction items, big buildings, and so forth, and the home-building field—in the home-building field where there are great needs now, we believe, for additional homes, we haven't had the advance in mass production. I think we have been held back, I think unwisely, by some of our labor friends where the rate has been kept too high, and the use of that labor in the construction of homes has actually been held back. In other words, I think more homes would be built, and I think they would have had more hours of labor and work, and more earnings over the year, if that hadn't been true.

Dr. ANDERSON. In the new developments in steel, these unusual things that have occurred in the last 10 or 15 years, do you see what

would amount to an entrance of steel into the construction industry in an increasing way so as to reduce the cost of home building? What is the future in your mind of that thing?

ARMCO RESEARCH IN HOUSING

Mr. HOOK. We think so. We have been spending a good deal of money in research in that field in the last several years. We have just, for instance, finished building a little unit—not so little, 27 houses is not such a small unit—of steel houses, and dollar for dollar we think that the buyer is getting a very much better product and more value for his money; well insulated, thoroughly insulated in fact, termiteproof and stormproof, tornadoproof—very many things that we think make it advantageous to the buyer.

Dr. ANDERSON. Is the widespread use of steel for housing or domestic homes in the immediate offing, in your opinion, or not?

Mr. HOOK. I wish I could answer you in the affirmative, Dr. Anderson, but I don't know. We are trying very hard to reduce costs in that field and get a home which can be built at very low costs. We have made a lot of progress and we are building very good houses at very reasonable figures at the present time.

Mr. O'CONNELL. Mr. Hook, looking at "Exhibit No. 2470" and relating it to the question I asked a little while ago about the price behavior in the sheet portion of the steel industry, I notice that two classes of buyers, the automotive and the metal container, constitute a little over 50 percent of the steel sheet buyers, and those industries, I take it, are characterized by a few in the industry, but large units.

Mr. HOOK. Very large units. For instance, the metal container, that is largely tinplate as you know.

Mr. O'CONNELL. Would you say that that fact, the fact that there are large buyers on that side, was a factor which helped to produce the reductions, the substantial reductions in sheet prices?

Mr. HOOK. I don't think there is any question about it.

Mr. O'CONNELL. You see, that price behavior is not characteristic of the steel industry generally as I would understand it.

Mr. HOOK. The other branches of the industry haven't had the technological improvements that made it possible for the price to be reduced.

Mr. O'CONNELL. They haven't had the large buyers, either.

Mr. HOOK. Oh, some branches have. You take in the railroads, for instance, they are very large buyers.

Mr. O'CONNELL. Lately? Not lately.

Mr. HOOK. Not what we would like to see, of course.

Mr. O'CONNELL. When we heard the story about the way the price of tinplate was arrived at in the prior hearing,¹ it apparently was a situation in which the Carnegie-Illinois representatives sit down with the representatives of the American Can Co. and thrash out a price, which apparently from your figures has tended to be a rather low price, relatively low over the years. In other uses of steel, take structural shapes or something like that, where you have a multitude of small buyers, the price has apparently remained relatively high as compared to the price of tinplate; isn't that true?

Mr. HOOK. I am not competent to express an opinion on tinplate because we don't make tinplate and I would rather not discuss a subject that I am really not competent to discuss.

Mr. O'CONNELL. It seemed to me that the fact that there are two groups of buyers representing about 50 percent of the market for sheets might have been a very important factor in bringing about the price reductions that there is evidence of.

Mr. HOOK. Of course, they can order in large volume, and if you can get a large tonnage of one size to put through your mill, that is quite a different operating problem than if you have to take that same tonnage and divide it up into innumerable sizes.

Mr. O'CONNELL. Yes; but purely on the bargaining side I take it that a large buyer is in a better bargaining position than a multitude of small buyers.

Mr. HOOK. I don't think there is any question about that.

Mr. O'CONNELL. And that would have some effect on the price structure, wouldn't it?

Mr. HOOK. It would have some effect on that, of course. But here you see are jobbers, they are small buyers, and yet there were 1,092,000 tons to jobbers and warehouses, and that has greatly increased, Mr. O'Connell, in the last few years.

Mr. O'CONNELL. Yes; I can see that.

DISPLACEMENT OF OTHER INDUSTRIES BY SHEET STEEL

Mr. HINRICHS. Just one more question on "Exhibit No. 2470" in terms of increases of employment. You have been emphasizing the contribution which the sheet industry has been making to total employment and pointing out, quite properly, that capital construction itself is important, and so forth. There are some deductions that need to be made, too. That is not your business, but in terms of the furniture item down here, it is a relatively small item, or in terms of the automotive item on the top, the introduction of plate represents in part simply business that would not otherwise have been done, but there has been at the same time some displacement of other products, hasn't there? There is less wood used in automobiles for example, less wood used in furniture which has been displaced by plate.

Mr. HOOK. Of course I am not competent to answer that question accurately, but you take the great increase in the number of automobiles that are produced since the introduction of steel into the automobile; I question whether there has been such a tremendous reduction in the amount of wood taken as a whole. I don't know.

Mr. HINRICHS. The number of automobiles isn't—

Mr. HOOK (interposing). Maybe Mr. Ford could have answered that question for you.

Mr. HINRICHS. I thought he testified the number of automobiles in 1937 was not larger than the number of 1929, for example; about the same number or a slightly smaller number.

Mr. HOOK. Yes; but we began to use sheet steel in the automobile in large quantities before the twenties. Of course, here in recent years the metal top has come in, when we were able to produce a sheet that we could make it out of. That undoubtedly reduced the amount of wood in those tops very considerably.

Mr. HINRICHS. To some extent, textiles. I think I remember there used to be a textile finish on the top.

Dr. ANDERSON. Mr. Hook, just to put a cap on that point, you wouldn't want to say that this represents new industry. You would say, wouldn't you, rather, that in all of the points listed here there is a certain amount of replacement that is a substitution of your product for something that has been used formerly?

Mr. Hook. Oh, to some extent, Dr. Anderson, but I don't think that has been a serious thing. I think the increased use—for instance, just see how much the automobile is using that fender; you can see with your own eyes, this old fender and the one today, multiply that by four. We have increased the actual amount of the steel because the public wanted it. Mr. Ford said yesterday, if you remember, that they spent, I think I am correct in remembering he said, about \$5,000,000 to change the face of it. This was one of the things we have done to help them change the face, when you look at the nose of that fender.

This table, "Examples of Increased Use of Sheet Steel," is presented to show you there are other industries in addition to the automobile. In electric refrigerators, we have contributed of course to some extent in the reduction of the cost, due to the cheaper, as well as better grade of steel that they are able to use in these enameled parts; and the same way in the electric washing machine. A few years ago, this tub, which is made by some of the manufacturers out of enameled material—that is, you stamp the tub and enamel it—just couldn't be made from the old sheet. We have improved it and that has made it possible for them to make a better product.

(The table referred to was marked "Exhibit No. 2471" and is included in the appendix on p. 17329.)

Mr. Hook. They have decreased the average unit price of their product 58 percent in electric refrigerators, and increased the number of units 1,027 percent during this same period, and the electric washing machine has decreased in price 51 percent and increased in use 75 percent.

Dr. ANDERSON. Mr. Hook, how much do you think the matter of increased volume has had a bearing in reduction in price as over against the difference in use of materials?

Mr. Hook. They couldn't get the increased volume until they were able to bring their price down so that they could get the increased volume. In other words, it wasn't only the technological development—we contributed, but all along the line the other manufacturers that were furnished them with parts had contributed, and they, themselves, have introduced more efficient methods.

FINANCING OF NEW CAPACITY

Mr. Hook. We showed you what we spent at Middletown for the construction of this mill, and here in this chart, "Industry Expenditures for Continuous Mill Construction," is the total for the industry. We won't argue over that distribution, Mr. Hinrichs, of whether it was in 2 years or not, but the total amount of money is fairly accurate, because that is from the Institute, and then rechecked with the manufacturers who furnished mills and equipment, and so forth.

(The table referred to was marked "Exhibit No. 2472" and is included in the appendix on p. 17330.)

The CHAIRMAN. Does that represent new capital?

Mr. HOOK. Yes, sir.

The CHAIRMAN. I mean in the sense of a new contribution and not a plowing in of earnings.

Mr. HOOK. Oh, well, that depends upon the particular company. We had to borrow all ours. Now, some of the companies were more fortunate, sir, and had cash surpluses that they could use and go into their working capital, but most of the companies did financing that introduced these continuous mills.

The CHAIRMAN. Would it be fair to say that most of this was new financing either by way of borrowing or stock sales or such?

Mr. HOOK. Of course, I would be guessing at that, Senator, and maybe I oughtn't to make a statement.

The CHAIRMAN. But in your own case it was a case of borrowing.

Mr. HOOK. That was borrowing, I know that.

Mr. HINRICHs. I am not going to take exception to your statement, but I wasn't trying to be unfair to you this morning and I would like to go the other way now. Actually the chart that you introduced this morning showing mills built in '26, '27, '28, '29, '30, in fact in every year down to 1937, indicates that the industry as a whole (irregularly it is true, because the volume wasn't the same in every year) was making a net contribution during that period through the construction industry.

Mr. HOOK. That is true.

Mr. HINRICHs. This particular branch of the steel industry is pretty nearly through on this thing and it is going to be something else. My criticism now would not be on a year-to-year basis but on a decade to decade basis if I were making it, and I wouldn't want to quarrel with you on that score. You have a very legitimate point on this one that you could have made.

Mr. HOOK. You have helped me out. You see, I didn't see it quite as quickly as you did.

Mr. HINRICHs. There is one question on this though, that I would be interested in. It is along a slightly different line, having to do with the concentration of sheet mill operations.

If I figure at all correctly, the minimum ante to get into this game is in the neighborhood of \$8,000,000. The smallest mill that you listed was a little over 200,000-ton capacity, and the cost per ton of capacity seems to be in the order of \$40.

Many of those mills that you spoke of, the 1,264 mills, were in rather small establishments a number of years ago, weren't they, in the sheet business?

Mr. HOOK. No.

Mr. HINRICHs. It has always been in large——

Mr. HOOK (interposing). The relationship of tonnage hasn't changed so materially. Take the Steel Corporation, I think today (we will have to examine the records very carefully because I am guessing now which I ought not to do, but I know you are not going to hold me to it) the proportion of the sheet steel production of the

country, for instance, indicates that the Steel Corporation produces today approximately the proportion it did back in '26.

Mr. HINRICH. I wasn't speaking of it in connection with the United States Steel Corporation or the idea of concentration in some one or two companies, but rather the concentration of business in essentially large producing units, so that some 8, 9, or 10 companies come to have virtually complete control of this particular field. I am not implying an improper control, but the operations in this field have come to be concentrated in a relatively small number of operating companies, whereas formerly there was a fringe of small companies operating with hand mills. Isn't that true?

Mr. HOOK. You are correct, that it is possibly more concentrated. That is, the proportion of the total capacity of the country today is larger with respect to, say, those 10 companies, than it was in 1926. Remember, there are still a lot of the old hand-mill companies that are working profitably, because they are making special products to some extent that it is difficult to make on the continuous strip mills.

Dr. ANDERSON. Is that the explanation for their operating on a profit basis, the small hand mills? I have got the impression from this testimony that this is so distinctly an advantage from a production standpoint that I can hardly imagine small hand mills operating successfully profitably against your competition.

Mr. HOOK. They do, but some of these hand mills are still operating on the specialties which I told you we ourselves must still produce on our hand mills, and when we find out how to make all the products on the continuous mill, I am perfectly frank to admit that they will either have to go to a continuous mill process or I think they will be eliminated, just as my father was eliminated from the carriage business.

Dr. ANDERSON. Is it true that there has been a process of elimination of the hand mills going on, say, since strip mills came in?

Mr. HOOK. Oh, yes; there has been. For instance, take our old Twenty-third Street mill, which was a part of the Ashland plant when we bought it back in 1921. I forget how long we ran it—2 or 3 years, maybe 3 years. It has gone completely, and many of the old hand mills of the Steel Corporation have gone completely, and that tonnage is now made on the continuous mills.

Dr. ANDERSON. Do you have any idea as to the number of concerns that have been closed as a result of the continuous mill?

Mr. HOOK. No; I couldn't answer that question.

Dr. ANDERSON. Do you know of any such figures?

Mr. HOOK. There doesn't come to my mind any particular plant that I can think of that has actually been eliminated and put out of business entirely by the continuous mill.

Dr. ANDERSON. What really happens? What occurs if they are not actually eliminated?

Mr. HOOK. Their operations to some extent have been reduced, and, as I say, they go into the manufacture of products in small quantities. It isn't profitable to make small quantities on these big mills. That is one of the things you have got to do. The little mill can make the over-the-counter stuff, and do that more profitably than we can.

Just think of it. I told you this morning, we make a coil running anywhere from 12,000 to as high as 17,000 pounds out of one slab, just rolled up in a great big roll like a big roll of paper, and it contains from 12,000 to 17,000 pounds, from 6 to 8 tons.

Mr. HINRICHS. I am confused at one point, probably because I haven't come to Middletown yet. This morning I understood you to say that you were operating your hand mills on material which had already been through the continuous strip.

Mr. Hook. Through the hot continuous strip, partly rolled down on the hot continuous strip, and finished on the old hand mills.

Mr. HINRICHS. So the survival of the hand mill in part depends now upon having a hot continuous strip operation in conjunction with the hand mill. Is that correct?

Mr. Hook. Not necessarily. For instance, just 30 miles from us: Mr. Hinrichs, at Newport, Ky., is the Newport Rolling Mill Co., operating what we call improved old hand mills. In other words, we have tables running from the furnace down to the rolls so that the man needn't by main strength and awkwardness pick that pack up and throw it on the floor plate. Then in back they have mechanical catchers, and the screw is operated by the roller, who stands and operates it just as he did on the old hand mill. I think they have 26 mills.

This chart really sums up all we have been talking about, if you stop and analyze it, because this dotted line is the United States Bureau of Employment Index, blast furnaces, steel works, and rolling mills, and you can see where that has gone, using the 1923-25 average as 100.

(The chart referred to was marked "Exhibit No. 2473" and appears on p. 16433.)

Mr. Hook. This line is the sheet and black plate production that we have been talking about that is made on the continuous mills, and this production has been very largely influenced, of course, as we have tried to present to you, by this continuous rolling-mill process.

PRODUCTION ON CONTINUOUS HOT MILLS

Mr. Hook. This black line here is the total hot rolled production, and the production of sheet and black plate is a part of that, so when you eliminate that, then you find that you have this line of hot rolled products other than sheets. So you can see what the increase in the sheet and black plate production has done to the curve for the total, and where it would have been without that.

Dr. ANDERSON. Mr. Hook, would it be possible to insert two more lines, breaking up the Bureau of Labor statistics, employment indexes, so that we could compare labor and production in one part of the industry with labor and production in another? If you had the two more lines there, we might have an excellent summary of your argument that this process does not, even within its own part of the industry, adversely affect employment.

Mr. Hook. Well, maybe we can get the Census Bureau to get that. There are no available figures now.

Dr. ANDERSON. I don't think they are available. I was just wondering.

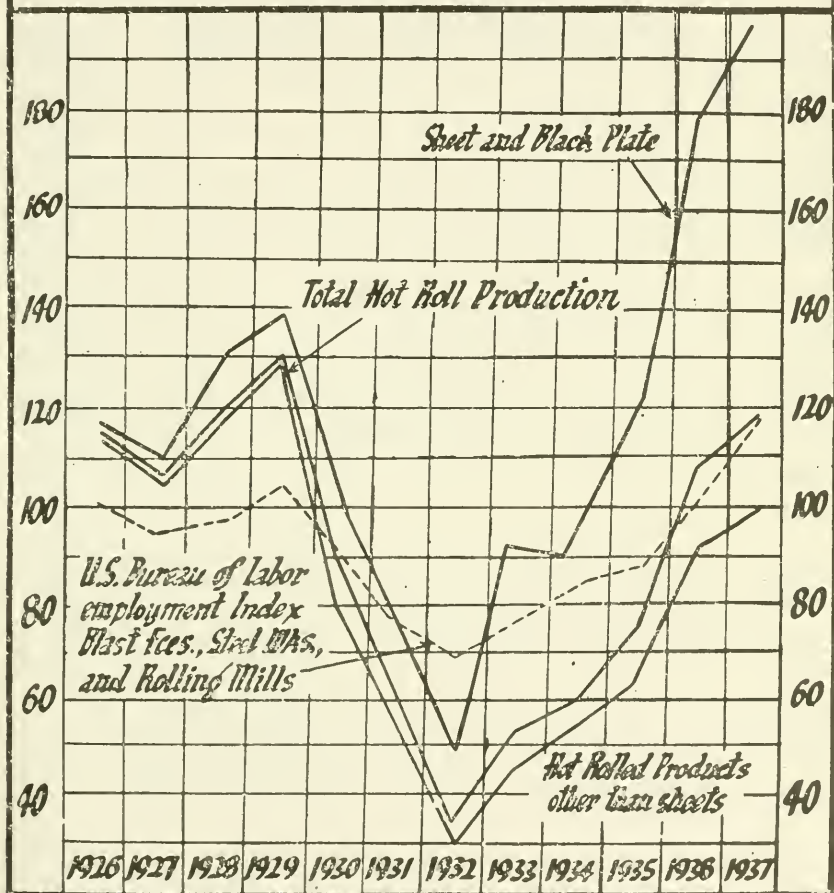
Mr. Hook. I wish we could have done that for you, Doctor, but we feel that this is very significant, and really sums up the story pretty well.

The CHAIRMAN. May I ask whether that trend exhibited upon "Exhibit No. 2473" is still apparent, or has there been any change?

EXHIBIT No. 2473

[Submitted by the American Rolling Mill Co.]

INDEX OF HOT ROLLED STEEL PRODUCTION (AVE. 1923-1925-100)



Mr. Hook. Yes; you remember the question was asked a little while ago, and we looked at our figures, and we found that it had continued during this period.

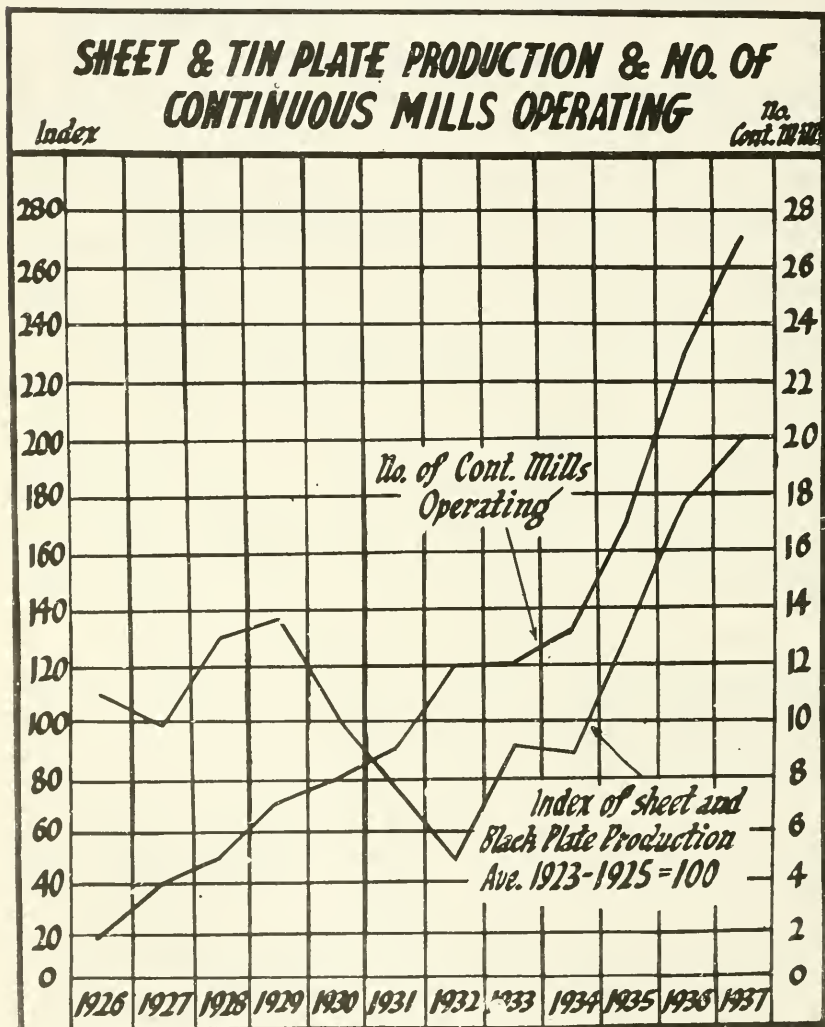
The CHAIRMAN. This ends in 1937, but it is still going on.

Mr. HOOK. Yes. In other words, this has affected favorably the trend of the total production. It is continuing, in other words, to be a larger portion of the total production of rolled products. The chart "Sheet and Tin Plate Production and Number of Continuous Mills Operating" shows that these continuous mills didn't come in all at once.

(The chart referred to was marked "Exhibit No. 2474" and appears below.)

EXHIBIT No. 2474

[Submitted by the American Rolling Mill Co.]



Mr. HOOK. Here is our first mill. It started in 1924, but we start with 1926. Then the next mill in '26, that was the Butler, and then the Weirton mill came in here; and if we went back to "Exhibit No. 2473," you could see how these mills came in during this period, and

it showed that the index of sheet and black-plate production came right along after this bad period in '32. It came right along with the introduction of these mills.

The CHAIRMAN. It is observable that this upward trend began apparently in 1933, didn't it?

Mr. HOOK. Yes; yes, it did. We got the first boost, you see, before 1929 was over. We got a couple of these mills installed, our mill, and the Butler mill and the Weirton mill were going before 1929, and I think the small mill at Gary, at the steel corporation, and we did get a jump in there, you see, in production during those periods, but that might have been a natural rise. In other words, I don't know that I can credit this to the continuous mill. [Laughter.]

The CHAIRMAN. On the previous chart, "Index of Hot Rolled Steel Production," "Exhibit No. 2473," there is a perfectly amazing increase beginning in 1934, of your steel and black-plate production. That line, '35, '36, and '37, is practically vertical; it runs up so rapidly.

Mr. HOOK. That is when you got the real effect of all these mills, because the majority of them came in from '33 on, where they really began to jump.

The CHAIRMAN. And the next chart, "Exhibit No. 2474," shows that the index of sheet and black-plate production has almost kept pace with the number of continuous mills operating. Now, you have been disposing and marketing the products without difficulty all this time? [Laughter.]

Mr. HOOK. I wish we could say that was true, Senator.

The CHAIRMAN. Well, let me put it this way. Has it been going into inventory or the channels of trade?

Mr. HOOK. Oh, no; it has been going into the channels of trade; absolutely.

The CHAIRMAN. So that it is an active industry and it still remains active.

Mr. HOOK. Very.

The CHAIRMAN. Expanding industry.

Mr. HOOK. Yes.

The CHAIRMAN. I hope your profits are expanding, too.

Mr. HOOK. Unfortunately, they have not. I am not particularly proud of the financial record. [Laughter.]

The CHAIRMAN. Now, to what do you attribute this increased demand for your product?

Mr. HOOK. Well, particularly to two things—the very great improvement in the quality, making it possible for the man who used it to reduce his cost because of lower fabricating cost, and the lower price at which he was able to buy.

The CHAIRMAN. Now you have told us that you were employing more persons—

Mr. HOOK (interposing). Correct.

The CHAIRMAN (continuing). During this period. Now, if all industries were showing the same results, we probably would have a much less difficult unemployment problem than we have, wouldn't we?

Mr. HOOK. Definitely.

The CHAIRMAN. Well, have you, from your observation and experience, any opinion to express as to whether or not the conditions in your industry are indicative of conditions in other industries?

LACK OF INVESTMENT AS CAUSE OF UNEMPLOYMENT

Mr. Hook. No, they are not, because I think that the large pool of unemployment today is the result of the lack of capital financing; in other words, the deficit in capital financing which I discussed the last time I appeared before this committee,¹ and of course, as you know, I think that I have very definite views on that, and if we go back, Senator, to the report of the Durable Goods Industries Committee, which was submitted to the President on the 14th of May 1934, and you follow through what has happened, those of us who were members of that committee and who have studied the matter since, believe that the things that we pointed out are still pertinent, and other things have happened, of course, since that time, that we think have affected the flow of corporate and private savings into production and trade. I am encouraged by one part of the joint resolution, which created your committee; in section 2 it says:

It shall be the duty of the committee, (a) to make a full and complete study and investigation with respect to the matters referred to in the President's message of April 29, 1938, on monopoly, and the concentration of economic power and financial control over production and distribution of goods and services, and to hear and receive evidence thereon with a view to determining, but without limitation, (1) the causes of such concentration and control and their effect upon competition, (2) the effect of the existing price system and the price policies of industry upon the general level of trade, upon employment, upon long-term profits, and upon consumption, and (3)—

And this is the point I want to bring up—

the effect of existing tax, patent, and other Government policies upon competition, price levels, unemployment, profits, and consumption—

And then (b) says—

to make recommendation to Congress with respect to legislation—

and so forth, on the foregoing subject.

I say it is encouraging to me because you haven't started on No. 3 yet. [Laughter.]

The CHAIRMAN. You'd be surprised. [Laughter.]

Mr. Hook. When you give business an opportunity to come down here under clause 3, and we haven't yet appeared on that subject, I think we will have quite a number of things to suggest that have militated against the flow of corporate and private savings into production and trade, particularly into the durable-goods industries, where I think your large pool of unemployment still exists.

In other words, there has been a using up of the capital assets of the country, and we haven't kept up with replacement, ordinary replacement.

Here—and I will be glad to leave this—the Machinery and Allied Products Institute have made a very exhaustive study and they said here:

The need for constant replacement of capital goods is seen when we note the decline in value of such property in daily use. A study by the National Bureau of Economic Research revealed that business capital is consumed at the rate of more than eight billion dollars per year. This amount of durable wealth in business, that is, capital goods, must be replaced each year if we are to maintain the nation's stock of durable wealth, to say nothing of expanding it for growth.

¹ See Hearings, Part 20, pp. 19805-19830.

And I believe that therein lies largely the answer to this question of unemployment. I am firmly convinced that with the proper study of the things which have militated against the flow of corporate and private savings into production and trade, the Congress can encourage business in such a way that confidence will be established and we will reinstate that flow, we will encourage that flow of capital, and that, in my opinion, is what is going to change this unemployment picture.

The CHAIRMAN. Of course, I might—

Mr. Hook (interposing). In other words, we want to get them off the Government relief rolls and onto the pay rolls of private enterprise.

The CHAIRMAN. I might say, and it may not be beyond the bounds of propriety, that my personal views have for a long time been that Congress might, with great success, endeavor to encourage so-called private industry to take up the slack in unemployment by some form of encouraging private investment.

One thought that I had in mind was to give employers of labor some form of a credit to be measured by the number of persons employed, but it is always difficult to suggest a formula without at the same time awakening fears. Not everybody who comes before this committee comes with the same objective attitude that you bring here, Mr. Hook.

Mr. Hook. Thank you, sir.

The CHAIRMAN. And not everyone realizes that the committee is endeavoring to discover something and not trying to make a goat out of the witnesses who come here.

Mr. Hook. I don't feel like that.

The CHAIRMAN. I know you don't and that is why I can say it to you.

Mr. Hook. I am, of course, quite frankly of the opinion that when we really get into a serious investigation under (3) of section 2, a lot of information can be brought here that has a very decided bearing on it, but we would have to spend a couple of days.

Mr. HINRICHs. May I ask a question at this point, please? Mr. Hook, what was the year that you were quoting there from the National Bureau of Economic Research?

Mr. Hook. 1938.

Mr. HINRICHs. That was a year of depression. I wonder if you wouldn't like to introduce in the record later, not now, a comparison of the net additions to business capital as shown by the National Bureau for 1929 and 1937?

Mr. Hook. Yes; I will.

Mr. HINRICHs. Just to give a year of active business.

Mr. Hook. We will prepare those figures over a period of time, and be very glad to have that opportunity.

Mr. HINRICHs. May I ask, has the sheet industry been unusually venturesome, and are you restrained at the present time so much by fear as by the 13,500,000 tons of continuous strip capacity shown in "Exhibit No. 2460"?

Mr. Hook. I fully expected that question to be asked some time—"Were we more venturesome than anybody else?" Well, it was a case of necessity. When a fellow comes along with a method of doing a thing that you have got to adopt to keep up with the pace, you go out and break your back to find the money to do that job,

to keep from going out of business, and that is just exactly what happened. We have proved by the introduction of this process that a quality of material could be produced that could not be produced by any other method, and if they wanted to keep in competition with the game, it was necessary to go out and put in one of these plants.

Mr. HINRICHS. Do I read your figures in "Exhibit No. 2460" incorrectly? By the end of 1929 there were 3,000,000 tons of continuous strip capacity. Between 1929 and 1932 there was some further building of strip capacity. I would assume that the capacity finished in 1930, and very likely that finished in 1931 was projected in 1929, but even including that capacity, there was only a comparatively small increase during the period when business was sliding off and you had no idea what your future volume would be. By the end of 1932 you had 5,400,000 tons.

Mr. Hook. That is right.

Mr. HINRICHS. Of continuous capacity.

Then, in this later period, when you saw a rising volume of business and saw some security in the future, there was a very rapid introduction of continuous strip mills, so that by the end of 1937 you had 13,347,000 tons of capacity, a little more than 4 times as much as you had back in 1929.

Now, is that an incorrect reading of those figures?

Mr. Hook. Those dates are correct. I haven't in mind, you can tell me what it is—but will you refer there to when the sheet and tube plant went into operation?

Mr. HINRICHS. Youngstown?

Mr. Hook. Yes.

Mr. HINRICHS. In 1934, and a second one in 1935; the Indiana Harbor in 1934.

Mr. Hook. That is when it actually was turned over. Of course they were some months breaking it in. But what actually took place, the sheet and tube technical men and operating men visited our plant many times during the period say, from 1928 particularly and 1929, up to the time when they made their decision to go ahead—and they were considering it all the time, making their estimates and finding out how they were going to raise their capital and so forth and so on, until finally they saw that it was inevitable.

EMPLOYMENT IN MANUFACTURING INDUSTRIES

Mr. HINRICHS. Didn't they also have in mind the line "All manufacturing" on this chart headed "Indexes of Employment," Exhibit 2475, or on the earlier chart, the total production, Exhibit 2473 that black line that goes sloping off from 1929, when it stood at 104.6, to 1932, when it stood at 65? That must have been also in their minds during that period when they were on the brink of considering building. Had they been maintaining employment, they would probably have been in the game very much earlier than they were; don't you think so?

Mr. Hook. I don't think there is any question about it.

Mr. HINRICHS. And when they saw that line turn up in 1932 and 1933 about that time it began to look as though there were some sense in a businesslike investment.

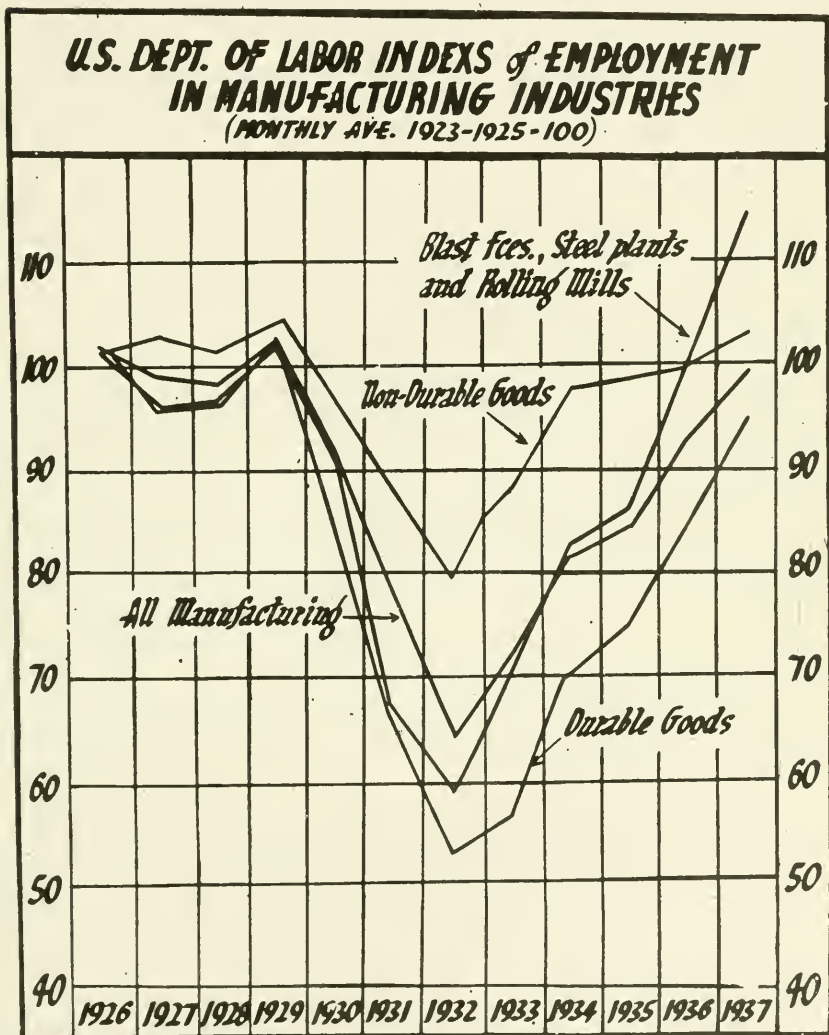
Mr. Hook. They knew by that time that if they were going to stay in the sheet game in a big way and hold their proportion of the industry they had to do it.

The CHAIRMAN. Now, what does the chart, "United States Department of Labor Indexes of Employment in Manufacturing Industries" show? You produced that chart for a purpose.

(The chart referred to was marked "Exhibit No. 2475" and appears below.)

EXHIBIT No. 2475

[Submitted by the American Rolling Mill Co.]



Mr. Hook. It is just comparative, that is all.

The CHAIRMAN. Isn't that the answer to the question that I asked you a little while ago?

Mr. Hook. Yes; I think it is.

The CHAIRMAN. You feel that this chart correctly represents the condition?

Mr. HOOK. Yes.

The CHAIRMAN. Then, reading it, we find that the blast furnaces, steel plants, and rolling mills have shown the same striking increase which was shown on your other chart from 1932 to 1937, an increase which you tell us by your figures for 1938 and '39 is continuing.

Mr. HOOK. Yes.

The CHAIRMAN. I asked you a little while ago if that increase in your business of capacity and of output was comparable with conditions in other industries, and you said you weren't able to speak for the other industries.

Mr. HOOK. No; this is the steel industry only. This is all manufacturing—

The CHAIRMAN. What does that line show with respect to all manufacturing?

Mr. HOOK. Here is your nondurable goods.

The CHAIRMAN. First let's deal with "all manufacturing." What does it show with respect to all manufacturing?

Mr. HOOK. Here it is. Here is your curve of all manufacturing. It lags way behind.

The CHAIRMAN. But it shows an increase, does it not?

Mr. HOOK. It hadn't reached, in 1937, the 1923-25 base.

The CHAIRMAN. What increase does it show from 1932?

Mr. HOOK. All manufacturing? Well, it starts at, say, about 65 and goes up to less than the base.

The CHAIRMAN. It has gone up from 65 to almost 100 in the 5 years from 1932 to 1937.

Mr. HOOK. That is right.

The CHAIRMAN. Now, what has been the effect on durable goods, according to the chart which you have produced?

Mr. HOOK. Durable goods has not kept pace with all manufacturing.

The CHAIRMAN. But what has been the actual effect? It increases from what—from 55 in 1932 to what, to about 95?

Mr. HOOK. To about 95.

The CHAIRMAN. So that in all three of these items which you have produced here there has been a steady and very striking increase of production, has there not?

Mr. HOOK. Yes; there has been that.

The CHAIRMAN. The nondurable goods apparently showed a striking increase from 1932 to 1934, and then tended to level off until 1936, and then began running up slightly again. Is that not correct?

Mr. HOOK. But they didn't get the drop that all manufacturing goods, and especially durable goods, had.

The CHAIRMAN. That is right, because the nondurable goods are the consumer goods.

Mr. HOOK. Yes.

The CHAIRMAN. In other words, this chart which you have produced here shows that these substantial lines of industrial activity have had an obvious increase since 1932.

Mr. HOOK. That is correct. I don't know where we would have been if it hadn't.

The CHAIRMAN. Well, with respect to your industry, you are well above the point which you occupied in 1929.

Mr. HOOK. Correct, and that is why I showed by that other chart, Senator, "Exhibit No. 2474," that the sheet tin and black plate produced on these continuous mills affected that very largely.

The CHAIRMAN. I ask you these questions because recently I read a report by Standard Statistics which showed that in 1939 the 669 leading corporations—utilities, railroads, and manufacturing corporations—had a net income in 1939 of more than 80-percent greater than in 1937, and yet we still have the unemployment problem.

Mr. HOOK. Well, in the meantime, Senator, over this period of time, 1932 to the present time, we have had an increase in the employable men. If we had kept up the normal increase, this figure should be way beyond where it is. If we had kept the normal trend going, we had an increase between 1926 and 1937, I think we showed, of 11.2 percent in population, therefore, we should have had an increase over that same period from 1926 to 1937 to keep up with that trend.

Now, in 1926, you see, the all manufacturing and durable goods lines started at practically base. We ought to have had somewhere around 111, or something of that kind.

The CHAIRMAN. Well, this is the question that frames itself in my mind. If we had an increase in durable goods from an index of 55 to 95 in a period of 5 years, as shown by your chart, and an increase in all manufacturing from 59 to 99 in the same 5 years, an increase of production in nondurable goods from an index of 80 to 102, an increase in all manufacturing from an index of 65 in 1932 to 99 in 1937, and an increase in blast furnaces, steel plants, and rolling mills from 60 to 115, can it be said that any of these industries were suffering any lack of confidence during those 5 years?

Mr. HOOK. Well, yes; I think so, because it should have gone way beyond where it is in the natural course.

The CHAIRMAN. Of course, we never are satisfied with the expansion which we have.

Dr. ANDERSON. But, Mr. Hook, looking at the chart again and its title, you have a chart that does not depict increases in durable goods or nondurable goods, or manufactured articles, but the labor employed in such activities. You would have to put an entirely different chart on there to determine what had happened to production during these years.

Mr. HOOK. Yes.

Dr. ANDERSON. Speaking in terms of our topic, namely, technology, if you laid alongside that chart, which indicates the use of labor in a very rough way, as you will agree, because these are labor indices—

Mr. HOOK (interposing). That is right.

Dr. ANDERSON. And not actually full-time employment, a series that would depict the thing the Senator and you have been talking about, what is your guess? Would it show total technological displacement of labor as this product moved upward from the trough of the depression or not?

Mr. HOOK. No; I don't think so.

Dr. ANDERSON. In other words, you would hold that productivity per unit produced on this rising market out of the slump of the depression had not increased in the over-all?

Mr. HOOK. The labor per unit probably has gone down. If it hadn't, we wouldn't have got the increase in production. The increase of production has kept up the employment to where it is.

Dr. ANDERSON. So you recognize the item of labor per unit as a factor?

Mr. HOOK. We do.

Dr. ANDERSON. And you linked with it, in order to have an over-all increase, increasing production of such proportions as to take care of individual displacement as it occurs. That is your thesis?

Mr. HOOK. That has been the case.

Dr. ANDERSON. Mr. Chairman, might I have the witness refer back to the testimony statement for a moment or two to ask several questions that we want in the record?

Mr. HINRICHS. May I talk to "Exhibit No. 2475" for a moment? Mr. Hook, I would like to give you a chance at this point in the record to introduce a table showing the annual averages of these several lines of employment in each year from 1926 to 1937. I don't know when your chart was drawn, and I don't recognize the terminal figure. Actually, the increases of employment appear to have been greater than those that are indicated on your chart, and it may be that your chart is not adjusted to the final census figures.

Manufacturing employment in 1937 was very slightly higher than it had been in 1929, and all of the indexes for 1937 are somewhat higher than they appear to be on your chart. I am sure that there was simply some slip in possibly the old and not revised figures, and I would like to have you have a chance, at your leisure, to correct the final record on that thing.

Mr. HOOK. They were taken from the *Survey of Current Business*, as issued by the Department of Commerce. This happens to be the 1938 supplement that those figures were taken from.

Mr. HINRICHS. There are two factors that haven't been taken into account, then, I think. One is the fact that the census changed its definition of what was manufacturing. Back in 1929 they included railroad repair shops and several other industries as manufacturing that don't appear in 1937, and there are always small adjustments that the Bureau makes in its figures, which were released in September of the past year. I will be glad to supply you with those.

I was going to suggest that the chart be withdrawn, but so much discussion centered on the thing that I think I would leave the chart, unless they prefer to withdraw it and insert the table in its place later.

The CHAIRMAN. I think the chart can remain.

Mr. HOOK. I will let Mr. Brooks confer with you, and we will work it out.

Dr. ANDERSON. I know we have imposed upon you greatly today.

Mr. HOOK. You haven't imposed upon me at all.

Dr. ANDERSON. From our standpoint it is only because of the seriousness of the problem we are discussing, and your wide knowledge and comprehension of it, and this remarkable paper and presentation that you have made, that I want to probe a little bit further in order to

have certain things in the record that seem to me to be extremely important.

NATIONAL ASSOCIATION OF MANUFACTURERS' STUDY OF OLDER WORKERS

Dr. ANDERSON. One of the problems of technology that concerns everybody of late is this matter of the elimination from employment of the older worker. This morning you referred to the National Association of Manufacturers' study of workers over 40. I take it it was this document, *Men Over 40*, that you had reference to. From your reading of the document, you came to the conclusion that there was no evidence to support the charges of various groups that are mentioned here—the American Legion and veterans' organizations—that older workers are being eliminated from industry.

Mr. HOOK. They cooperated with us.

Dr. ANDERSON. Might I point out that from my own standpoint as a student of the problem, and I think this is agreed in by others who have studied it, this pamphlet in no sense, in any comprehensive way, permits that conclusion. I draw your attention to the final chapter, the final supplement, No. 3, from which most of the data are derived, and I hope later you will add something for our record on this topic if you differ with me. The table was based on group insurance statistics of life insurance companies covering the years '23, '28, and '37. The age distribution of industrial employees had altered as follows: those over 40 years of age who were covered by group policies, industrial workers, were 31.7 percent of the total in '23, 33.7 percent in '28, and 32.3 percent in '37.

In other words, from '28 to '37 there was a decline in the proportion of people aged 40 and over covered by this insurance.

That would lead me to believe that these data show nothing conclusive with respect to retaining older workers in industry generally.

Mr. PIKE. Do you happen to know, Dr. Anderson, whether the insurance companies themselves may have changed their policy regarding insuring employees in the groups over 40?

Dr. ANDERSON. Nothing is indicated in the pamphlet, which, by the way, is important because it has had wide distribution.

Mr. PIKE. During the hearings on insurance¹ we had some indications that in some instances they changed the views about the desirability of certain forms of insurance, and I don't know whether group insurance was involved.

Dr. ANDERSON. The National Association of Manufacturers did one other thing. It sent out a questionnaire to its members and got back returns for the year '37 and the year '38. I point out again that you cannot tell anything decisively from 2 successive years by way of a trend of conditions, but I simply want to add that the number of reports returned for 1937 was 2,089, those for 1938 were 1,582. I haven't read the pamphlet recently, but I remember in the reading I made of it, and I trust my memory is correct, that it does not include detailed analysis of the study, so that we do not know the exact identity of the respondents in the 2 successive years. We do not have what scientific students of the problem consider a safeguarded study.

¹ See Hearings, Part 10.

There was a difference there of 6 percentage points in the 2 successive years; on the down-sweep over the peak employment year of 1937 to '38 there seemed to be a retention of older workers in the industries. So far as I know, however, there is no substantial body of evidence in this or any other document that proves that industry as a whole is retaining its older workers, and I wanted to ask Mr. Hook if, in his analysis of the problem, he had discovered such data, and if he did have them, would he supply them to the committee for its use.

Mr. HOOK. I referred to that, Dr. Anderson, because it was conducted by a subcommittee under the employment relations committee of the National Association of Manufacturers, and it was conducted in conjunction with the service men and several other organizations. I happened to be chairman of the resolutions committee in 1937, when representatives of those various organizations appeared before our committee and argued that men over 40 were being eliminated and were not being given an opportunity. We said, "Well, come along and join with us and let's find out what the facts are. We will furnish the money and you cooperate," and if you will read what they said about the study on the very first page you will find that they were very complimentary and very appreciative of the work which we did.

I would have to go through it and study it carefully—

Dr. ANDERSON (interposing). It was not my thought, Mr. Hook, to criticize the study so much as to raise the question which it seems to me industry should be more concerned about—and I was pleased to see your own concern about it—namely, the elimination of the older worker. I was wondering whether you have data from your own plant to indicate what has occurred there.

Mr. HOOK. We have. I hope Mr. Brooks has them here.

Mr. BROOKS. I have it only back to 1929, and the percentage in 1929 and 1939 of workers over 40 is practically the same—30 percent in both years.

Dr. ANDERSON. In '29 and '39?

Mr. BROOKS. Yes, sir.

Mr. O'CONNELL. Do you have it for any intervening years, or just for those two?

Dr. ANDERSON. Let me just ask this one point, then. That is a 10-year period of time, and you know that during that period of time the proportion of older people in the population has been increasing. If that is true, and we don't have the information for those years available, it would show that there was no tendency on the part of your firm to employ older workers in preference to other workers.

Mr. BROOKS. Well, your total employment has increased in this period, I believe.

Dr. ANDERSON. Might I ask this, Mr. Hook. If we were to frame you the headings of a table that would bring out this point, could you supply us with the information from your company records?

Mr. HOOK. I think we can. We will be delighted to give you any information, Doctor, that you want and we can furnish.

Mr. PIKE. May I ask one more question along that line? It is normal, I think, for the growing business to pick its employees out of the pool which is normally becoming employable, whereas in the declining business it is also normal, isn't it, for the concern to keep on with the

men that it has, or if it has to drop people, to drop the youngest people that it has? I wonder if, in the concern that is growing, the average age of the employees would probably not increase, and might even tend to decrease it. A concern that is standing still, or contracting, such as the railroads, might find its average age of employees increasing. I would think that generally—I wouldn't say invariably—the human manager dealing with the human machine would tend to keep his old people and discharge the younger ones without family obligation. So that, since your own business has grown substantially during that 10 years, it might be that your percentage of old men hasn't increased because you have been picking them out of what is normally the large pool of those employables, that is, those coming of age.

Mr. HOOK. Correct. Unless you were making a real effort to hold your older-than-40 men in the period, the percentage would have markedly decreased, because the number that you would employ as you increased your production, of course, greatly increased the total. In other words, your older men represent a smaller percentage of the total in 1937.

Now, if your percentage remains the same, that shows that you really have employed a larger percentage of the older men. You haven't let them off, you have kept them on.

Dr. ANDERSON. That is right, you haven't let them off.

Mr. HINRICHS. What age groups have you?

Mr. BROOKS. They are in 5-year groups.

Mr. HINRICHS. What was the percentage of 30-35 in 1929?

Mr. BROOKS. It was 15 percent.

Mr. HINRICHS. And 40-45 in 1939, 10 years later?

Mr. BROOKS. It was 13.78 percent. May I explain that the distribution is changing. These are taken from group insurance records, and I might point out in 1929, that distribution covered 8,858 employees, whereas in 1939 the distribution covered 11,210 employees. Now, this is not to be confused with total employment because not all employees are included.

Mr. HINRICHS. Mr. Anderson, I wonder if instead of asking for a special tabulation, it wouldn't be helpful, at least in the first instance, to have that distribution inserted in the record, if that is a proper request. There is the information.

Mr. HOOK. This chart? Yes.

Mr. HINRICHS. If that meets our needs, nothing further may be needed in the way of a special tabulation.

Mr. HOOK. We would be glad to give you any records we have.

Dr. ANDERSON. You don't have the story of the data on new entrants?

Mr. BROOKS. I don't have it with me.

The CHAIRMAN. You do have it, then?

Mr. BROOKS. It could be gotten by going back through all of our employment records over a period of years.

The CHAIRMAN. I didn't mean to suggest that.

Mr. BROOKS. It is not tabulated.

Dr. ANDERSON. In the hiring of new employees, you make no distinction on the basis of age?

Mr. HOOK. No.

Dr. ANDERSON. That doesn't come in at all?

Mr. HOOK. Oh, naturally, for instance, you wouldn't take a man 60 years of age and put him up on a crane handling 60 tons of hot metal.

Dr. ANDERSON. But you do not have any form or anything?

Mr. HOOK. No, indeed.

Dr. ANDERSON. I want, then, to read from your statement, and, without belaboring the point that I raised earlier in the day, ask you something concerning the whole statement on this basis. You say:

For that purpose, I have chosen—

in order to determine what has happened here—

the period covering the years 1926 down to 1937, because it was during that period that all but one of the continuous sheet rolling mills were introduced into the steel industry.

Following that, your testimony has been based in display after display on these 2 years, 1926—

Mr. HOOK (interposing). Period.

Dr. ANDERSON. 1926 period; 1937 period. I wonder if it would be possible in order to get the true picture—and I think you agree that would be necessary—to get the intervening years on the same basis? Could you extend your table and just give us the table that you have here, just supply the intervening years?

Mr. HOOK. You mean give you the information for each year?

Dr. ANDERSON. Just as you have it in the tables, but each year separately.

Mr. BROOKS. Would you want that on the single plant we used as the case example or the total company? I think the single-plant illustration, since it is the only plant where the old hot-plate process was actually replaced by the continuous mill, would probably be more illuminating for your purposes.

Mr. HOOK. Otherwise you confuse other products.

Dr. ANDERSON. For example in "Exhibit No. 2461," "Estimate of Number of Workers Employed in Industry in Hand Mill Processes Including Preparatory, Rolling, and Shearing Operations," you show 2 years, and on that basis you come to this conclusion which is so extremely interesting to me, and I know to the committee, that there was a net increase of 42,000 workers.

Mr. BROOKS. What was that statement?

Dr. ANDERSON. You say the estimated number of workers is an increase in 1926—

Mr. BROOKS (interposing). No; that is not an increase. The 42,000 workers are those who were in employment on those mills in 1926.

Dr. ANDERSON. Right; but now you get a net—

Mr. PIKE (interposing). Of 27,000 decrease.

Mr. BROOKS. A possible decrease in that number; yes.

Dr. ANDERSON. The possible decrease is on the basis of the 2 years compared is what I am trying to say.

Mr. BROOKS. That is right; it is on the basis of the total tonnage manufactured in 1926, which I believe was the greatest sheet and tinsplate tonnage year up to that point.

Dr. ANDERSON. My point is this: I am led to believe by reading and study of the problem, and conversation with people engaged in the industry, that the displacement effects of the continuous sheet-rolling process are most noticeable following 1937. In other words,

I understand that these mills were introduced gradually, as you pointed out today; they finally began to have the increasing proportion of all production; and in the last 2 or 3 years noticeable changes have occurred.

Now I refer to your comment that some 90,000 people are supposed to have lost employment as the result of this continuous sheet-rolling process.

Mr. HOOK. That was the statement that has been made.

Dr. ANDERSON. And that statement has been made, as I remember, within the last year or so, and I understand it refers to things that have happened within the past 2 years. Would it be possible to carry your figures forward through '38 and '39?

Mr. HOOK. I think we can.

Mr. BROOKS. Well, it is rather difficult to carry them forward on the basis we have used, because in the year 1926 there was very little continuous-mill tonnage. There was only one continuous mill actually in operation throughout the year. Therefore, we could take the unit of production per man and divide into it and arrive at a reasonably correct figure of the total correct employment.

That is not true in 1939. The only way you could ever carry those figures through would be by a check-up with every manufacturer of sheet steel to see how many people he has employed on those mills.

Dr. ANDERSON. In other words, you have to go into estimating for such a year as '39.

Mr. BROOKS. We did make a check-up on which we based our estimate of 15,000, contacting a number of producers as to what mills they were operating.

Dr. ANDERSON. I wonder if you would be willing to go through the tables at your leisure and give us the sources, where they are not indicated, and the bases of computation where such things were computed?

Mr. BROOKS. Yes; I would be very glad to do that.

Dr. ANDERSON. Such data are lacking in certain instances and when we read these at our leisure we want to know what they are based on.

Mr. HOOK. When you come to Middletown, Doctor, and we go into this more thoroughly, we can get a lot of those figures, a lot of information.

Mr. BROOKS. Dr. Anderson, could you give me a list of those instances where you want the references?

Dr. ANDERSON. Yes; we will do that, if you will permit us to raise the questions we have been talking about here and hand them to you so you can fill them in.

Mr. BROOKS. All right, sir.

The CHAIRMAN. You testified a little while ago that reduction of price was an important factor in increasing the distribution of your product and all steel products?

Mr. HOOK. That is correct.

The CHAIRMAN. So, I take it you agree with the testimony of Mr. Ford yesterday, and of other witnesses, in response to my questions, that increasing the capacity of the masses to purchase commodities is one of the most important factors in providing for increasing prosperity, technological advance, and general welfare.

Mr. HOOK. You are right, Senator. I referred to that a little while ago when I commented on the things that I thought could be done to bring that about, in order to get the men off the relief rolls and onto the pay rolls of private enterprise.

The CHAIRMAN. Where they ought to be, of course.

Mr. HOOK. Where they ought to be.

The CHAIRMAN. Are there any other questions to be asked of Mr Hook?

PROVISIONS FOR DISPLACED EMPLOYEES

Mr. HINRICHS. Mr. Hook, I wonder if you care to comment briefly on what you did with reference to specific workers in terms of preventing a dislocation and a displacement. Jobs were changed by this process, changed quite extensively. You commented that the over-all employment was perhaps even greater than it had been in your company.

Mr. HOOK. Well, in our particular case, I can give you exactly what we had, because I have here a copy of the notice. We called all the men together who worked on the old-style mills, in our auditorium, oh, I think it was the 4th of January 1929, and we explained to them what was going to happen, that we thought that eventually the 1,191 men (I think I remember correctly the number employed at that time in the old-style sheet mill department) would all be dismissed and we would have to find jobs for them in other departments. If we couldn't find jobs for them, we worked out a separation allowance, and I will read it to you, and then I will give it to you for the record. We posted this afterward after explaining it to them. The subject was, "Plan for handling hot-mill employees in connection with new finishing mills." [Reading:]

1. We do not expect to be able to find jobs for employees who have been with the company for less than one year.

2. Jobs will be found on new finishing mills for as many men as are necessary for their operation and every effort will be made to place as many as possible in other positions in our various plants.

The employment department will have charge of placing men.

3. Men who are not placed will be given half pay for as many months as they have years of service but not more than 6 months and with a minimum of \$50.00 per month.

4. No special payment as outlined in Paragraph Three will be given to men who are placed in any of our plants.

5. Any man who accepts a position in our plants, but decides within a period of 30 days that for some reason he is not able to go on, will receive the payments as outlined above.

In other words, he had 30 days in which to decide whether he'd take his separation allowance or keep the job which we put him on. [Continuing.]

6. Continuous service with full insurance will be carried for the period mentioned in Paragraph Three on all men who are not placed in our plants.

7. If an employee gives up a job and receives payment as above and then starts with the company later his special payments will cease and he will not receive them again if he should leave the company's employ a second time.

8. If requested, the company will be glad to assist in placing men with other companies if positions cannot be found in our plants.

(The document referred to was marked "Exhibit No. 2476" and is included in the appendix on p. 17330.)

Mr. Hook. Now, as a matter of record, because I think you will ask me the question, "Well, how many men were employed?" Well, at Middletown, in that plant, 393 received their separation allowance. The rest of them were taken care of, and we paid those 393 \$208,233, or \$530 per man. At Ashland, Ky., and I mentioned that we shut that old hand mill down after the new continuous mill had been in operation 2 or 3 years, there were 199 men. They received \$76,660 or \$385 per man. So there was a total of 592 men. The total amount we paid was \$284,893, or an average of \$481 per man.

Now some of those men got as high as, oh, \$1,900, for instance, a roller.

The CHAIRMAN. Five hundred and ninety-two men out of how many?

Mr. Hook. Well, at Middletown, there were 393 out of 1,191, as I recollect. Now, of those 393 who got their separation allowance, most of them are back again in the plant. They bought gasoline stations and several of them thought they'd start a little grocery store with the money that they got. They had the experience that many people have had who go into business. They failed, and so they came back and worked in the mill, so there are not very many of those men out. Some of them are now on what we call our idle-time pay roll. We do not have within our company what we call a definite pension plan. We take each case, and I forget how many men are on the idle-time pay roll now. Do you know?

Mr. Brooks. I don't know exactly, but I'd say offhand about 110.

Mr. Hook. Who are on the idle-time pay roll. In other words, we use that term. The men like to feel that they are still in our employ. They are doing something. We may call on them for a little service, so they are not pensioned. They are just on the idle-time pay roll. Each case is judged on its own merits. In other words, one man may need more assistance than another, depending upon whether he is married and has a family that are still dependent upon them.

Mr. HINRICHS. They are not compensated for the amount of time that they do work for you?

Mr. Hook. Oh, no. That is just a monthly allowance.

Mr. HINRICHS. Now, these 199 men in the Ashland plant were all of the employees in Ashland. Is that correct?

Mr. Hook. Well, no. We took some of those men. There were more men than that employed in that plant. I forget just how many were employed there, but we took men from what we called the Twenty-third Street plant, which was the old plant, now dismantled, and we took them down into the new plant as we increased the production down there. We took them out of the old plant and put them into the new, and many of those men are now working down in the new plant who were formerly employed in the old plant.

Mr. HINRICHS. They were given the same options as the people in the old plant. They had the option of staying or of taking a—

Mr. Hook (interposing). Yes. Yes; we found jobs for them in the new plant, or they could take their separation allowance, and in that case many of those men are back.

Mr. HINRICHS. Some of those separation allowances were voluntary, I judge. With others, there was a clause in there that you

would keep them if you could. Otherwise they'd get a separation allowance.

Mr. HOOK. Correct.

Mr. HINRICHs. Now, is it fair to assume that most of these 592 men were men for whom you couldn't find jobs at the time?

Mr. HOOK. No. Quite a number of those men were offered jobs, and they preferred to take their separation allowance. A good many of them have told me since, "I wish I hadn't taken it and stayed in the mill, because I'd be further ahead now," because they have had to come back into the mill and take positions that are lower-paid jobs than they had before.

Mr. HINRICHs. So that at the time you were making the change-over, you also had to go out into the labor market and hire new people for these jobs that were available to the old people, but which were—

Mr. HOOK (interposing). To some extent, that is true.

Dr. ANDERSON. How widespread is this separation pay-roll allowance method in the industry as a whole?

Mr. HOOK. I can't answer that question, Doctor. The National Association of Manufacturers' Committee on Employment Relations has a subcommittee working on this plan, and we have been urging manufacturers throughout the country to plan ahead when they know that the technological development is going to displace temporarily a certain number of men, and try to plan ahead and train them for jobs.

Mr. HINRICHs. This took place within your own establishment and your business was expanding over this period in total employment?

Mr. HOOK. Correct.

Mr. HINRICHs. There has been some displacement in hand mills that have failed, closed down completely, I presume. Hasn't there?

Mr. HOOK. Oh, I must presume, also.

Mr. HINRICHs. Has the industry made any industry-wide effort to deal with that problem? Those are men who are not your individual responsibility, as the executive of a single company, but they are the outside casualties for the industry as a whole.

Mr. HOOK. Industry-wide, no. Each company has carried out its own program, whatever it may be.

Mr. HINRICHs. Have there ever been any discussions as to what approach of that sort is even feasible?

Mr. HOOK. Oh, there have been discussions amongst executives, naturally, as we discuss all sorts of problems amongst ourselves, but not as an organized discussion. But there has been organized discussion in the National Association of Manufacturers' Employment Committee. For instance—this hasn't anything to do with this, but I only use it as an illustration—at the present time, we have a very able committee studying the problem of regularization, and I don't know whether you have seen our latest report on that or not. I think it would be very interesting to you, particularly. If you haven't it, I hope you will get it.

Mr. HINRICHs. Casualties of that sort, the small plant that has 100 or 200 employees that closes up, would have to be handled, if at all, on the basis of an industry approach to the problem. There isn't any surviving responsibility by a responsible employer to deal with the problem, is there?

Mr. Hook. Well, if a company actually goes out of business, why——

Mr. HINRICHS (interposing). That, however, has been a part of the process, as a reflection of this large extension of these very large units, hasn't it?

The CHAIRMAN. Mr. Hook, were you going to make another comment?

Mr. Hook. No; Mr. Brooks was just calling my attention to the fact that there are a good many companies that are folding up for other reasons than technological development.

The CHAIRMAN. We are very much indebted to you for a very interesting day. It has been very nice to have you here.

Mr. Hook. Thank you.

The CHAIRMAN. Tomorrow morning, Mr. Philip Murray, who was to have been called today, will be the first witness. The committee will stand in recess until 10:30.

(Whereupon, at 4:50 p. m., a recess was taken until Friday, April 12, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

FRIDAY, APRIL 12, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Thursday, April 11, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman) and King; Representatives Williams and Reecé; Messrs. Henderson, Pike, Hinrichs, O'Connell, Kreps, and Brackett.

Present also: Boris Stern, Department of Labor; Frank H. Elmore, Jr., Department of Justice; William T. Chantland, Federal Trade Commission; and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order. Dr. Anderson, are you ready to proceed?

Dr. ANDERSON. Mr. Chairman and members of the committee, we devoted the day yesterday to management's story in the steel industry as told so ably by Mr. Hook. Today we propose to present to the committee a witness able to discuss the problem from the side of the workers. Mr. Philip Murray, chairman of the Steel Workers Organizing Committee of the C. I. O. is the witness to be presented at this time. He has with him his technical assistant. I presume you will swear them.

The CHAIRMAN. Do you both solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. MURRAY. I do.

Mr. RUTTENBERG. I do.

The CHAIRMAN. You may be seated. Dr. Anderson, it would appear that Mr. Murray has a rather substantial statement to make, and in the interests of expedition, if it is agreeable to you, I will ask members of the committee, so far as possible, to refrain from interrupting the witness until he has completed his statement. If we can make our notes as we go along, then we can ask the questions after Mr. Murray has concluded, and I think probably we will get better results.

TESTIMONY OF PHILIP MURRAY, CHAIRMAN, STEEL WORKERS ORGANIZING COMMITTEE; ALSO HAROLD J. RUTTENBERG, ASSISTANT

Mr. MURRAY. Mr. Chairman and members of your committee, I welcome this occasion to present testimony to the Temporary Na-

tional Economic Committee on the social and economic effects of technology, and want to express my appreciation to the members of the committee for this opportunity.

Although the purport of my testimony is national in character, the bulk of my observations are confined to the basic iron, steel, and tin producing industry, which I shall hereafter refer to as the steel industry. The spirit in which I present this testimony is a cooperative one, as it is my understanding that the committee's function is to arrive at the essential basic facts about our economy for the purpose of devising solutions to the chronic economic ills with which it is afflicted.

The most vital of these chronic economic ills is unemployment. The crux of the unemployment problem, particularly in relation to the displacement of men by machinery and other technological improvements, seems to lie in the unwillingness of industrialists and certain of our statesmen to recognize the facts. Before discussing technological unemployment in the steel industry, I want to make a few general observations.

The upswing in business and industrial activity, which reached a peak in the last quarter of 1939 has demonstrated irrefutably that the American economy has not kept pace with the advance in technology during the past decade; and that industry is not expanding to absorb the workers displaced by technology. Last November and December industrial production in the Nation as a whole surpassed the all-time peak in 1929, with fewer workers.¹ In the great industrial district of Pittsburgh production rose 6 percent from August 1929 to November 1939, but during this period man-hours worked declined 19 percent.² It is plainly observable, therefore, that the most crucial problem confronting our economy is the failure of employment to keep pace with production. The seriousness of unemployment is demonstrated in Pennsylvania, where 24 percent of the working population was unemployed last December, the month when national industrial production was higher than in 1929.³ At the same time unemployment in the Nation as a whole was a discredit to our industrial civilization, the estimates ranging from 9,000,000 to 11,000,000 unemployed workers, men and women idle through no fault of their own, men and women no longer wanted or needed by private industry.

Occasional pronouncements from men in high places seem to be focused upon the elimination of unemployment when our national annual income rises several billion dollars above the peak year of national income. The goal of a \$90,000,000,000 to \$100,000,000,000 annual income is impossible of attainment as long as industry in America continues its present practices. To eliminate unemployment by raising the national income is getting the cart before the horse. The national annual income cannot be raised until the unemployed are put back to work. And as long as industry continues its present practices of eliminating workers to maintain profits, our national income cannot be raised above the level of recent years.

¹ Federal Reserve Bulletin, February 1940, p. 81. (Mr. Murray's footnote.)

² Pittsburgh Business Review, December 29, 1939, Bureau of Business Research, University of Pittsburgh, Pittsburgh, Pennsylvania, pp. 17-18. (Mr. Murray's footnote.)

³ Pennsylvania Public Assistance Statistics, October 1939, Department of Public Assistance, Commonwealth of Pennsylvania, Harrisburg, Pennsylvania; and correspondence between the Research Department of the Steel Workers Organizing Committee and the Department of Public Assistance. (Mr. Murray's footnote.)

The apologetic attitude of political and industrial statesmen concerning a solution of this problem of unemployment might very well be likened to the attitude of leading industrialists and Republican statesmen during the period 1930 through 1932, when they said that a policy of waiting would result in a return of prosperity. The attitude of industrialists and certain statesmen of today concerning the solution of the present unemployment problem is the same. We are told: "Let's wait and things will eventually straighten themselves out." The Nation and its people have been going through this period of waiting for more than a decade, and here we are with 11,000,000 people still idle, whilst the heavy hand of taxation, directly attributable to Nation-wide unemployment, engulfs the country and jeopardizes the perpetuity of our democratic form of government. In recent years this "Wait-and-things-will-work-out-all-right" attitude has been altered slightly by saying no one shall starve. But even this slight alteration is being abandoned, and less than a quarter of the unemployed are being given meager W. P. A. jobs.

On every hand we hear the cry of industry, and also we hear the cry from Government: "Give us greater productivity, increase our efficiency, lower the production costs of our commodities, and thereby create greater buying power, and this will afford the cure for all the unemployment evils confronting the Nation." This has been the battle cry of America for a period of almost 8 years. Labor has responded to it. Efficiency has been increased. Workers have cooperated, applied more energy, put forth greater effort, and increased productivity. What has been the reward? It has been a lower annual income for labor, a greater number of men thrown out in the streets, and a shorter work year for the workers still employed. The greater efficiency, is not being passed on to consumers, but is going into corporate profits, which surpassed 1929 profits in the last quarter of 1939. All this while millions of workers are idle. Here is another case of working men and women responding to a national emergency, giving their all in reply to the battle cry of industrialists, politicians, and economists. And what has been labor's reward? In return for their cooperation, the workers of this Nation have unemployment, poverty, and all the misery that trails in the wake of both. Monopolistic controls have grabbed up the fruits of greater efficiency and turned them into the highest corporate profits in the history of America.

Almost every corporation and company in America today maintains an army of industrial engineers and efficiency experts, whose duty it is, through the process of time evaluating of jobs, to increase the productivity of the individual, and thereby lower the costs of production. The science and ingenuity of man in developing processes and methods to increase production and increase efficiency has run amuck in the United States during the past 10 years. There has been no planning, and so far as I am aware there have been no checks or restraints. As a matter of fact, every agency of government, every leader and owner of industry, and almost every economist of national repute, has loaned every effort toward the attainment of this goal of ever-increasing efficiency in American industry. Indications point to continuing improvements in efficiency and production during the years to come. Out of this situation there may develop the greatest pros-

perity or the craziest national economy ever recorded in the history of any civilized nation.

In this machine age, is this age of technological improvement going to spell the downfall of our democracy? Or are these improvements in the production facilities of modern industry going to be utilized to promote the social well-being of our national population, and thereby maintain for America the best form of democratic government we believe to be anywhere in the universe? Factual investigations conducted by responsible economists and statistical organizations reveal the very alarming fact that the trend in American industry today, due to the introduction of machines and other improvements in efficiency, is toward greater monopolistic control in all kinds of industrial and manufacturing enterprises. Technology, for example, is building a new monopoly in the steel industry.

In substance, the present program of industry, insofar as I am able to observe with relation to the introduction of new mechanical devices and other technological improvements follows this pattern: Introduce a machine or a new method; increase productive efficiency 15, 25, or 50 percent; increase hourly wage rates a fraction of this percentage; lower the number of man-hours per year considerably; lay off such other men as may not be required where the new machine or the new method for increasing productivity has been introduced; and gobble up most of the benefits of greater productivity into profits. There is the situation in American industry today. It seems, therefore, to be the bounden duty of the leaders of industry, government, banking, farming, and labor to get together under the auspices of the Federal Government and do something of a constructive nature to put more people to work, to absorb in industry the people who are now unemployed, and to give the youth of the country a chance in life, thereby increasing the national income, and alleviating the present high taxation imposed upon our people for the purpose of maintaining an impossible economy, an economy made impossible of maintenance through taxation because of the failure of private industry to employ the unemployed workers of America. I shall have more to say about this proposed national conference on unemployment in the concluding part of my statement.

The CHAIRMAN. Perhaps I may interrupt you here, Mr. Murray, because I note that you have come to the conclusion of your general observations. If any member of the committee wishes to ask any questions on the general observations, this might be an appropriate time to do it without actually obviating the rule laid down at the outset.

Dr. ANDERSON. Mr. Chairman, the general observation depends upon certain other parts of the general statement, and I have some questions that I wanted to reserve until a later time.

The CHAIRMAN. Very well, I just wanted to give everybody a chance.

TECHNOLOGICAL CHANGES IN THE STEEL INDUSTRY

Mr. MURRAY. No industry has been harder hit by technology during the 1930's than the steel industry. Before discussing the new steel technology, its social and economic consequences, I want to make the position of the Steel Workers Organizing Committee on technological changes perfectly clear. The Steel Workers Organizing Committee

does not oppose technological advances; in fact, the Steel Workers Organizing Committee approves them and conducts a continuous education campaign amongst its members in favor of technological improvements. The attitude of the Steel Workers Organizing Committee, unlike that of the run-of-mine employers, does not stop there. In approving technological changes, the Steel Workers Organizing Committee's objective is to secure the participation of labor and consumers in the economic benefits of such changes and to eliminate the devastating social consequences of such changes on workers, their families, and entire communities.

Those who choose to charge the Steel Workers Organizing Committee with opposing technological advances misrepresent the Steel Workers Organizing Committee's position for the purpose of erecting a smoke screen behind which they try to deprive workers, as well as consumers, of the benefits of technology. These parties would likewise have us believe that there is no such thing as technological unemployment, and in their attempt to prove this they try to create the impression that workers are participating in the benefits of technology when, as a matter of fact, such is not the case. My purpose in this discussion is to present the facts of the new steel technology, as briefly as possible, in their logical sequence.

The story of the new steel technology during the past decade is one of technological unemployment, the permanent displacement of workers, the elimination of skilled workers no longer young in years, the ruination of complete communities, the abrupt closing of entire plants, the cancelation of labor's contribution to national purchasing power, a constantly rising labor efficiency, the failure to reabsorb the displaced workers to create a corresponding number of jobs elsewhere, the inadequate participation of labor and consumer, and the intensification of control of steel-producing facilities in fewer and larger hands.

The largest single technological improvement of the 1930's has been the continuous automatic steel strip mill. Twenty-seven of these mills, commonly called hot strip mills, have been built to date with a combined annual capacity of 15,000,000 tons.¹ The first mill was operated in 1924, and the twenty-seventh mill was put into operation in 1938. I am submitting a list of these mills with full particulars, and the members of the committee have a copy of that exhibit.

(The table referred to was marked "Exhibit No. 2477" and is included in the appendix on p. 17331.)

Mr. MURRAY. The common contention that increased wage rates are responsible for technological improvements has no validity in connection with the automatic strip mills. The facts in this case show the opposite. All of the automatic strip mills were completed, under construction, or authorized to be constructed by the respective steel companies before steel wages were raised in 1936 and 1937. The introduction of the hot strip mills preceded the current level of hourly wage rates, and not vice versa. The introduction of these mills, therefore, cannot be attributed to higher wage rates. Mr. Charles R. Hook, president of the American Rolling Mill Co., estimates the total cost of the 27 mills at one-third of a billion dollars.² The respective

¹ Steel Facts, June 1939, American Iron and Steel Institute, New York City, p. 2. (Mr. Murray's footnote.)

² Pittsburgh Press, December 13, 1937. (Mr. Murray's footnote.)

companies have announced the cost of individual hot strip mills at figures ranging from \$25,000,000 to \$45,000,000.

The hot-strip mills produce only flat-rolled steel products. Their capacity of 15,000,000 tons almost duplicates the old-style hand-mill capacity for flat-rolled products. In 1929 the capacity of the old-style mills was 15,600,000 tons of flat-rolled products (plates, sheets, black plate, and tin plate).¹ The peak annual production of flat-rolled products on strip and hand-style mills was 16,900,000 tons in 1937. Thus the modern automatic hot-strip mills, with a capacity of 15,000,000 tons, can handle most of the demand for flat-rolled products made on the steel industry.

For technical reasons certain flat-rolled products can be rolled only on the old-style mills. But since 1929 an increasing percentage of the industry's flat-rolled production has been on the automatic hot-strip mills. Automatic strip-mill production of tin plate, for example, far exceeds the hand-mill production of tin plate at present. In 1936 only 23 percent of the tin plate was produced by the strip mills. In 1937 the percentage rose to 35 percent, in 1938 to 61 percent, and in the first 9 months of 1939 to 76 percent. In the meanwhile, the tin-plate hand mills have been abandoned with lightning speed, as I shall discuss later. It is plainly observable that before long virtually all of the tin-plate hand mills will be permanently abandoned. And within a few years only a handful of the old-style plate and sheet mills will still be operating. The automatic hot-strip mills are fully able to handle virtually all of the demands for flat-rolled products. If, at any time in the future, demand should exceed present automatic strip-mill capacities, additional strip capacity will be built instead of operating the old-style high-cost mills; this, in fact, is what has been taking place recently in the tin-plate division of the steel industry.

LABOR DISPLACEMENT IN HOT STRIP MILLS

Mr. MURRAY. The extent to which the strip mills eliminate workers is incredible. Mr. John D. Knox, a practical mill man and associate editor of *Steel Magazine*, recorded the following conversation with an official operating a strip mill with whom he discussed how much labor (the strip mills) displace technologically:²

"At the rate of 2500 tons a day and working 24 days a month," I said, "you'd deliver to the shipping end of your mill 60,000 tons monthly or exactly what a plant with eight conventional sheet mills would produce a year. In other words, on the basis of gage for gage your mill will produce 12 times the output of a conventional eight-mill sheet plant."

"Sure thing, and with a lot less men. Take your eight hand mills," he continued turning the leaves of his notebook until he came to a blank page.

"You have a crew of 112 men per turn," he said writing these figures at the top of the page. "Now add a cranesman, a sheet bar stocker and a couple of helpers, a yard clerk, and four shearmen and their helpers and you have a total of 125 men or 375 required to man the mills per 24-hour day."

"Now let's see. On the back of the heating furnaces of this continuous mill we have a heater and a couple of helpers, a furnace charger, a furnace stocker and a couple of helpers, a clerk in the slab yard and a couple of crane men. That's a total

¹ Directory of the Iron and Steel Works, Twenty-second Edition, 1935, American Iron and Steel Institute; Twenty-third Edition, 1938; Annual Statistical Report of the American Iron and Steel Institute, 1939; and *Steel*, November 6, 1939. (Sources of data in this and succeeding paragraph.) (Mr. Murray's footnote.)

² *Steel*, October 22, 1934, "Continuous Mills Voracious in Cost, But How they Produce]", by John D. Knox, pp. 19-23. (Mr. Murray's footnote.)

of 10 men," he said adding up the figures he had set down after each of the occupations.

"On the mill proper we have a head roller and one assistant, a gager, a rougher and his operator and helper, a couple of rolls hands, a speed regulator and his helper, a finisher and his assistant, a looper operator, an operator for the runout table and his helper, an inspector, a recorder, a roller leveler operator, a hot bed recorder, a shear foreman and his crew of eight men, one torchman for burning cobbles and three cranimen.

"That is a total of—let's see," and adding up the column he arrived at a total of 32 men to operate his mill or 42 men per turn including the furnace attendants. "This is 126 men to handle the mill per 24 hours."

"In other words," I chimed in, "with 126 men in the slab yard, on the furnace and overseeing the mill you can turn out 2500 tons a day whereas it would take 96 sheet mills of the conventional type with a combined crew of 4512 men to produce an equivalent tonnage."

"Yes sir, that's about the set up."

This tremendous increase in production for each worker employed—that is, that 126 men in the automatic steel mills can produce the same tonnage as 4,512 men in hand mills—represents a 97 percent reduction in man-hours, according to Mr. Knox's figures. Human labor is practically eliminated on the hot-strip mills. Electrical power is substituted. Steel is rolled on the hot-strip mills at speeds approximating a half mile a minute. The large numbers of men formerly required to roll steel are no longer needed.

Such wholesale elimination of workers has been devastating. The strip mills are displacing 84,770 workers, 38,470 of whom have already been disconnected from the steel industry.¹ Just 10 days ago in Massillon 500 workers in Republic's sheet mill there were given this notice:

We regret to advise you that on account of the permanent discontinuance of operations of the Massillon sheet mills your services are hereby terminated.

Please find enclosed your copy of the "Termination Notice to Employment Office." This form should be presented to the paymaster to secure any earnings which may be due you.

Also find enclosed "Workers Copy" of Form UC 406, "Separation Report for Total Unemployment" as provided under Unemployment Compensation.

Yours very truly

(signed) REPUBLIC STEEL CORPORATION

(The chairman, Senator O'Mahoney, resumed the chair.)

Mr. MURRAY. And 500 men walked out and 500 men are walking the streets of Massillon today; they have nowhere to go. That happened only 10 days ago.

This notice was given to these 500 workers on March 29, 1940, and within the next few weeks between 500 and 600 more will receive the same notice.

In the Niles, Ohio, plant of the same company 450 more workers are also out of employment, as Republic Steel has discontinued its sheet mill there also. A public announcement of the discontinuance of the mill in Niles was published in the newspapers on March 28.

These workers have not been disconnected from the industry one by one. They have been cast out a thousand at a time. Fifteen hundred. And in one case 3,000 workers were told to go home and never to come back, as their mill would not work again. Aside from the inhuman effect this wholesale abandoning of mills has on the individual worker, look at what happens to entire communities. Property becomes next to worthless, business drops to a fraction of previous levels, families are kept in existence by W. P. A. and relief, the social fabric of the

¹ See "Exhibit No. 2479."

town is torn in shreds, and the only means of making a livelihood is taken away from workers, many of whom have never known any other way of earning a living. All this happens because technology has found a new method of production, in this case the automatic strip mill. The financial cost of a strip mill is \$15,000,000, \$20,000,000, or \$40,000,000. But the social cost of this automatic mill is far greater in terms of human misery, personal tragedy, and wrecked mankind. Look at the worker immediately displaced.

A large percentage of these technologically displaced workers are skilled men. They have spent years acquiring their skills, and now private industry has no use for them. These men are no longer young in years, though they are not too old to work. But they are unemployed, discarded by the steel industry because profits cannot be made from their skills any more. These men are capable of many more years of good work, but private industry is no longer interested in them because most of them have reached the ripe old age of 40 years.

Rather than relate the tragic circumstances of these men who are victims of the strip mills, I have brought one of these skilled hand-mill workers with me to tell this committee his own story in his own way.

Michael Russell has not been employed on one of the United States Steel Corporation's strip mills for a very definite reason. The vice president in charge of operations of a large steel firm told me that he had hired a completely new force of men for his strip mill, mostly very young men. He explained: "A hand-mill worker is used to producing from 5 to 10 tons in 8 hours, and he can't get used to seeing a thousand or more tons produced on a strip mill in the same time. We have to break in new men on the strip mills who have never seen a hand mill operate." The comparatively few hand-mill workers who have been employed in automatic strip mills—and remember 37,000 of them are out completely—are working as laborers or semiskilled workers, and are receiving wages one-half to one-third of their former daily earnings. The social effects of the strip mills are doubly devastating.

Now, Mr. Chairman, with your permission I would like to present to your committee, Mr. Russell. He typifies one of those 37,000 men who have been cast out on the streets. Mr. Hook produced for the benefit of the committee yesterday some of the new technological improvements that have been brought about in industry in the form of examples of mud guards and fenders. I want to submit for the benefit of the committee a piece of our human wreckage here, Mr. Russell.

The CHAIRMAN. Mr. Russell, do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. RUSSELL. I do.

The CHAIRMAN. Do you care to make a statement here?

Mr. RUSSELL. Yes, sir.

The CHAIRMAN. Did you want to question him, Dr. Anderson, or Mr. Murray?

Mr. MURRAY. I should like to, if you don't mind, Mr. Chairman.

Dr. ANDERSON. Will you question the witness? He is your example.

TESTIMONY OF MICHAEL RUSSELL, NEW CASTLE, PA.

Mr. MURRAY. Mr. Russell, how old are you?

Mr. RUSSELL. I am 48.

Mr. MURRAY. Forty-eight years of age. How long were you an employee of the Steel Corporation before you were summarily discharged or dismissed in 1937?

Mr. RUSSELL. About 32 years.

Mr. MURRAY. What was your occupation with the Steel Corporation prior to your dismissal in 1937?

Mr. RUSSELL. A roller.

The CHAIRMAN. A what?

Mr. RUSSELL. Roller.

Mr. MURRAY. A roller is one of the highest type of skilled craftsmen in the industry, is he not?

Mr. RUSSELL. That is right; yes, sir.

Mr. MURRAY. And therefore one of the highest paid?

Mr. RUSSELL. That is right.

Mr. MURRAY. You are a married man, are you not?

Mr. RUSSELL. I am.

The CHAIRMAN. What were you paid?

Mr. RUSSELL. Well, in the neighborhood of from \$12 to \$16 daily, depending on how much tonnage we produced, but as an average it runs anywhere from \$12 to \$14 or \$16 a day.

The CHAIRMAN. What was your average?

Mr. RUSSELL. Daily or pay period?

The CHAIRMAN. Well, let us say your average annual earning.

Mr. RUSSELL. Well, for the year of 1937 I can give you a brief statement here; I have it on a card which was given to me at the time; \$2,842.99.

The CHAIRMAN. That was your annual compensation for the year 1937?

Mr. RUSSELL. Yes; minus 19 days of November, also of December, not working. In fact it would have been more than \$3,000 if I had worked the balance of the year.

The CHAIRMAN. You worked all but 19 days that year?

Mr. RUSSELL. In November when they terminated my work. That is when we were shut down, in 1937, November 11.

The CHAIRMAN. How did that working year compare with the ordinary working year in your experience in the industry?

Mr. RUSSELL. Well, this in fact was one of the best years we had because there was a great boom on at the time.

The CHAIRMAN. What was the poorest year you had during your experience?

Mr. RUSSELL. I don't have the definite figure but it ran in the neighborhood of \$2,000 or \$2,400 yearly anyhow.

The CHAIRMAN. Then would it be proper to say that your earning in this highly skilled employment was never less than \$2,000 a year?

Mr. RUSSELL. That is right.

The CHAIRMAN. Over how many years?

Mr. RUSSELL. In the neighborhood of 20 years that I have rolled.

Senator KING. Do you have any persons working under you?

Mr. RUSSELL. Yes, sir; a roller in a hot mill is responsible for eight men besides himself.

Senator KING. Did they receive as large wages as you received?

Mr. RUSSELL. They did not.

Senator KING. What were their average wages per day?

Mr. RUSSELL. As a rougher he would average in the neighborhood of \$9 or \$10 daily; that is a roller's assistant.

Senator KING. Each of those men under you received approximately \$8 a day?

Mr. RUSSELL. Well, they would average better than that, some of them \$10 or \$11, heaters and so on.

Senator KING. Did you work for the same company all these years?

Mr. RUSSELL. I did; yes, sir.

Senator KING. What company was it?

Mr. RUSSELL. Carnegie-Illinois Steel Corporation, better known as U. S. Steel.

Senator KING. In the same mill, were you, all those years?

Mr. RUSSELL. In different mills; the Shenango and New Castle plant.

The CHAIRMAN. And was this the scale of wages throughout your experience of 20 years?

Mr. RUSSELL. They vary up and down there with different scales from time to time, you know, and some were larger in some years and some years they were lower.

The CHAIRMAN. Wasn't there a substantial improvement in wages during those 20 years?

Mr. RUSSELL. Well, yes, there were, there were some.

The CHAIRMAN. What did you get when you started?

Mr. RUSSELL. When I started first they didn't have what is known as the four-part system; there was a three-part system at that time. When I first started in the mill a roller made \$10 a day on a level, very large wages, but it gradually came up as wages came up in the industry at the time.

The CHAIRMAN. How about the number of working hours in the day?

Mr. RUSSELL. We had to put in 8 hours daily.

The CHAIRMAN. When?

Mr. RUSSELL. Every day we worked.

The CHAIRMAN. But when did the 8-hour day begin?

Mr. RUSSELL. Well, I began working 8 hours in the hot mill; they started in at midnight at 12 o'clock.

The CHAIRMAN. You misunderstood my question. In what year was the 8-hour schedule instituted?

Mr. RUSSELL. Eight hours always in the hot mill.

The CHAIRMAN. Always?

Mr. RUSSELL. Yes, sir.

The CHAIRMAN. During the 20 years, then, the 8-hour day was the rule?

Mr. RUSSELL. That is right.

Mr. MURRAY. The weekly hours, of course, prior to 1937 were 48 and 55, wasn't it, 6 days a week?

Mr. RUSSELL. That is right.

Mr. MURRAY. There is a distinction in the classifications of labor there, and the labor rates at the mill that Mr. Russell worked at November of 1937, ranging from a minimum of 62½ cents an hour for common labor, with the maximum of the rollers based upon entirely the production. They were piece workers, and those rates may have ranged anywhere from \$8 to \$15 a day, depending upon their production and their efficiency to produce in the old conventional hand-mill type of furnaces.

Dr. ANDERSON. Mr. Russell, you were on piece rates?

Mr. RUSSELL. Yes; tonnage rates; that is right.

Dr. ANDERSON. And were you at the peak of the tonnage rates of employed workers?

Mr. RUSSELL. That is right.

Dr. ANDERSON. Anybody get any more than you did per tonnage rate?

Mr. RUSSELL. Based on—

Dr. ANDERSON (interposing). In other words, you are the highest skill known in the industry in the old hand-mill process?

Mr. RUSSELL. The roller; yes, sir.

Dr. ANDERSON. And this top wage that you have just indicated, an annual earning of \$2,800, is a good year?—'37 is your peak earning? Did you ever earn any more than that?

Mr. RUSSELL. Not that I know of because I always worked on a small mill. The other mills, larger mills—in fact, they make around \$4,000 in the bigger mill, see, \$3,000 and \$4,000.

Dr. ANDERSON. A man in your class of work?

Mr. RUSSELL. Yes, sir; bigger force on the same type of mill.

Dr. ANDERSON. What do you suppose the average worker in the plant in which you have been employed was earning when you were earning \$2,800?

Mr. RUSSELL. Well, I don't understand that; you mean the average worker, lowest-paid man in the hot-mill department?

Dr. ANDERSON. You perhaps wouldn't have the figure. You got \$2,800 that good year, and I was wondering what the average worker might be earning in the same mill that year.

Mr. RUSSELL. Well now, in the tonnage part of it, some of them would average around \$7 and \$8 a day; \$7 at least.

Mr. MURRAY. We have a collection of all the statistical matter with reference to the average wages of men employed in Mr. Russell's mill, and all other mills that I know of throughout the country, and for Mr. Russell's particular mill in the year 1937 the gross average earnings of all employees approximated \$1,658.

The CHAIRMAN. We interrupted you, Mr. Murray, in the questions you were going to ask Mr. Russell. You may proceed.

Mr. MURRAY. You are a married man, Mr. Russell?

Mr. RUSSELL. Yes; I am.

Mr. MURRAY. How many in your family?

Mr. RUSSELL. Four.

Mr. MURRAY. Four children, and your wife.

Mr. RUSSELL. Four children; six in the family.

Mr. MURRAY. Were any of your family working in the Shenango and New Castle Works when you were laid off?

Mr. RUSSELL. When I was laid off there was a son-in-law of mine at work, but there aren't any at work at this time at all.

Mr. MURRAY. All off?

Mr. RUSSELL. All off.

Mr. MURRAY. How many men were laid off in your mill in November 1938?

Mr. RUSSELL. Sixteen hundred.

Mr. MURRAY. Sixteen hundred automatically displaced?

Mr. RUSSELL. That is right.

Mr. MURRAY. That is, thrown out by an order of the Steel Corporation that there was no more work for them.

Mr. RUSSELL. That is right.

Mr. MURRAY. And your two sons were thrown out into the streets with them?

Mr. RUSSELL. That is right.

Mr. MURRAY. Have you been able to get any employment since you were laid off in November 1937, any employment of any description in private industry?

Mr. RUSSELL. We tried in 1938. I had a brother-in-law living up at Erie and he wrote me a card and asked me to come up, because he thought we could get some work on the docks up along Lake Erie, the shipping docks, labor work and all that; so I took my son and another friend of mine and we drove up to Erie to investigate. There wasn't any work on the docks, so coming back home, on Twelfth Street, I noticed a plan with a sign, "Acetylene welder wanted." That is a trade I did follow for a few years, acetylene welding and cutting, so I stopped and applied for the job, went in the employment office and asked if they were looking for welders and he said, "Yes; we are," so I told him what I wanted.

He sent for the general foreman and the foreman came out and he told him what I wanted and told him to put me to the test to see whether I did know what acetylene work was about. It was all right, he took me back to the employment office and said, "The man is all right, he came out very favorably on the test."

The employment agent asked me, "What is your name?" and I told him. He said, "Where are you from?"

I said, "New Castle."

He said, "How old are you?"

I said, "47."

He said, "Hell, man, you're too damn old to start with this company now."

That is what I was confronted with right there. There was no way out, I was too old to start with.

Mr. MURRAY. What are you doing at the present time?

Mr. RUSSELL. Working on W. P. A.

Mr. MURRAY. What are you getting?

Mr. RUSSELL. \$48 a month.

Mr. MURRAY. \$48 a month?

Mr. RUSSELL. Yes, sir.

Mr. MURRAY. And you are the only one in a family of six that is working, are you?

Mr. RUSSELL. The boys are working on W. P. A., but they are married and living by themselves as individuals.

Mr. MURRAY. So that the \$48 is all that you get to provide the needs of your wife, and how many dependents?

Mr. RUSSELL. One son.

Mr. MURRAY. One son and yourself. You pay your rent—

Mr. RUSSELL (interposing). That is right.

Mr. MURRAY. And your food and medical and other obligations, and maintain your home on \$48 a month.

Mr. RUSSELL. Well, with \$48 a month we maintain paying the rent and some of the food, but as far as medical attention and clothing and so on, those are neglected. We can't afford to get it because the money won't reach that far. We have to skim along, and as far as rent is concerned, we couldn't get a home like I had when I was working in the mill, paying \$25 or \$30 a month rental, so I had to get one of the boys and we rented a big house of 8 rooms and a 3-room finished attic, so there we split the house up together and split the rent, and all utilities so we could get by.

Mr. MURRAY. So that your married sons are now living with you?

Mr. RUSSELL. One of them is living there, and my daughter and her husband are living there. They have their own apartments but it is all in the same household, and that is how we manage to get by.

Senator KING. Did you acquire a house of your own during those years when you were working?

Mr. RUSSELL. Yes; I did.

Senator KING. You owned your own home?

Mr. RUSSELL. I owned two homes at one time, during the World War, but I disposed of them when the World War was on, and I never owned any since.

Representative WILLIAMS. At the time you were let out of employment, what reason was given for it?

Mr. RUSSELL. They didn't give us any reason at all, to be honest about it. They just told us the mill was down, and that was all there was to it.

Representative WILLIAMS. Did they shut the mill entirely down?

Mr. RUSSELL. Absolutely down.

Representative WILLIAMS. Permanently?

Mr. RUSSELL. They told us that was the end of the mill.

The CHAIRMAN. Has it ever been reopened?

Mr. RUSSELL. Never reopened; no, sir.

Representative WILLIAMS. And these 1,600 that were let out with you represented the entire force in the mill?

Mr. RUSSELL. Yes, sir.

Representative WILLIAMS. What became of them, if you know? Did they make any effort to secure employment for them in some of their other mills?

Mr. RUSSELL. Probably some of them did go about, but hundreds and hundreds in New Castle are doing the same thing as I am doing at the present time.

Representative WILLIAMS. Do you know why the mill was shut down?

Mr. RUSSELL. The only reason for it was the strip mill that is in operation that put us out of work.

Representative WILLIAMS. The old process had become obsolete, and they had by this new process of continuous rolling supplanted

the work that was being done by some other plant by that new process.

Mr. RUSSELL. That is right.

Mr. PIKE. Has the mill been dismantled?

Mr. RUSSELL. No, sir; it is still there.

Mr. PIKE. It has never been used since?

Mr. RUSSELL. No, sir; it has not.

PROVISION FOR DISPLACED WORKERS

Dr. ANDERSON. Mr. Russell, we were told yesterday in Mr. Hook's testimony, and showed evidence that when he made the change-over to the hot-strip continuous mill, he announced to the workers the condition, what was going to take place, and offered them the alternative of a dismissal wage amounting in some instances to a substantial sum, which many of them took as they were dismissed because of the change-over to the continuous-strip process.

In your experience, did anything like that happen?

Mr. RUSSELL. No, sir; it did not.

Dr. ANDERSON. When were you notified that the mill was going to close down, the day you were dismissed?

Mr. RUSSELL. No; I can give you an answer to that. It was in 1937. That year was a very good year. Mr. Sturdy, who was superintendent of the New Castle works at that time, when we first got word of that, and Mr. Hall, they took all us rollers in the office for a meeting and they explained and told us at that time that they insisted on us rollers making these men, our crews—that we see that these men got to work, because they had so many orders ahead and they held us responsible. They said, "We have been working on it since the previous year." That was in about the latter part of September. Then in November, I think just about the first part of November, we got word the mill was going to shut down, and it did shut down on November 11, and it hasn't moved since.

Dr. ANDERSON. But you didn't get any dismissal wage benefit?

Mr. RUSSELL. No, sir; nothing at all.

Dr. ANDERSON. And you had, according to your testimony, 1 or 2 weeks' notice. Was word given to you by the plant superintendent?

Mr. RUSSELL. No; it was just word out through the plant.

Dr. ANDERSON. Just a rumor?

Mr. RUSSELL. Just a rumor was what it was; yes, sir; but it did come.

Senator KING. Was a new plant constructed to take the place of the old, only changing the process?

Mr. RUSSELL. As far as I know, it was the strip mill down around Pittsburgh.

Mr. MURRAY. The Iroquois works, a new stripping mill erected at Clairton.

I think, Mike, you might have gone astray in stating you had no work in private industry following your dismissal in the New Castle work in private industry following your dismissal in the New Castle job at the Shenango works of the United States Steel Corporation?

Mr. RUSSELL. You are right; that did slip my memory. I was called back in the Shenango mill in the latter part of December in '37. We

went there, in fact all of us rollers; and they rehired us as catcher helpers on the job that I had started at 32 years ago as a boy.

The CHAIRMAN. How many of you were rehired?

Mr. RUSSELL. I should say about 200 anyhow, about that. They put me on the job where I started 32 years ago as a catcher helper. I didn't like it, in fact, to be lowered away down like that, but I had to take it or I couldn't draw compensation or get on relief to get a W. P. A. job, so I had to take that and do as I was told, and I was let out July 8, 1938.

Mr. MURRAY. You were let out July 8, 1938, in the Shenango works?

Mr. RUSSELL. That is right.

Mr. MURRAY. What happened in the Shenango works?

Mr. RUSSELL. The orders got so slack, it was a 40-mill plant and they were only operating 20 mills, so they doubled the staff up.

The CHAIRMAN. How far from New Castle is Shenango?

Mr. RUSSELL. They are all in one town, probably half a mile apart.

The CHAIRMAN. Is the Shenango mill still working?

Mr. RUSSELL. No, sir; it is not.

The CHAIRMAN. Is that closed down?

Mr. RUSSELL. It is.

Mr. MURRAY. How many men did the Shenango works employ before it was permanently abandoned by the Steel Corporation?

Mr. RUSSELL. In the neighborhood of 3,600.

Mr. MURRAY. And they were automatically displaced by the same order?

Mr. RUSSELL. That is right.

The CHAIRMAN. As I get your story, you spent 20 years acquiring a skill as a rolling mill operator.

Mr. RUSSELL. That is right.

The CHAIRMAN. The hand-mill operation.

Mr. RUSSELL. That is right.

The CHAIRMAN. And when you had reached this peak of skill as a result of 20 years of work, a new process was invented which did work that you had been doing, more efficiently and at greater speed than the hand-mill that you and your associates had been operating, could operate, is that right?

Mr. RUSSELL. That is right.

The CHAIRMAN. Therefore, the new mill which was constructed in another town took the work away from your mill and from the workers in the mill?

Mr. RUSSELL. That is right.

The CHAIRMAN. The mill at New Castle has never again been opened?

Mr. RUSSELL. That is right.

The CHAIRMAN. And the workers at New Castle who were displaced have never since obtained work at anything like the compensation they were getting when the new continuous mill came into operation and displaced them?

Mr. RUSSELL. That is right.

The CHAIRMAN. And you and many others have been compelled for the most part since that time to support yourselves upon inadequate W. P. A. wages?

Mr. RUSSELL. Yes; that is right.

The CHAIRMAN. And without the W. P. A. you would have had no opportunity to work at all?

Mr. RUSSELL. That is right.

Dr. ANDERSON. Mr. Russell, I wanted to ask a question. If you had been employed in one of the new strip mills after being laid off when the hand process was done away with, what would you have done? Your skill is not called on in the strip mill now, is it?

Mr. RUSSELL. Now you are asking something I can't answer, because I don't know anything about a strip mill. I never saw the inside of one, never got the opportunity to see inside one.

Dr. ANDERSON. Did you go and apply as a roller in a strip mill?

Mr. RUSSELL. I didn't think I could because it is a different system altogether from the hand packing.

Dr. ANDERSON. Then the only place you could dispose of the skill you have taken 20 years to perfect is another hand-process mill.

Mr. RUSSELL. That is about all.

Dr. ANDERSON. What is happening to the hand mills? Have you tried to locate work in hand mills?

Mr. RUSSELL. In fact there isn't any. They are all down. They are doing away with all the hand-packed mills.

Dr. ANDERSON. Is that the general impression among workers such as yourself?

Mr. RUSSELL. It must be, because we are always looking around and can't find any, we don't know where to go.

Dr. ANDERSON. Was there any attempt made by the mill for whom you worked to retrain you, to fit you into some other part of the mill?

Mr. RUSSELL. No, sir; none whatever.

Representative WILLIAMS. Your statement that there are none seems to be entirely in contradiction to what Mr. Hook said yesterday when he said there are practically half of them still maintained, as I remember his testimony.

Mr. RUSSELL. I don't know what Mr. Hook's intentions are. In fact I don't know; I have never seen the inside of the strip mill, I don't know anything about the strip mill.

The CHAIRMAN. Perhaps it might be worth commenting that Mr. Hook was testifying with respect to the firm of which he is the head.

Representative WILLIAMS. No, not as I understood him; I understood him with reference to the whole industry that there were practically half of them left in operation, the hand mills he was talking about.

Mr. PIKE. I think he said there were about 750 still standing and about half of the 750 or 375 were still in operation, not necessarily full operation but still used a good part of the time, and some of them as I think you said, Mr. Murray, were still necessary for certain finishing operations.

But probably not in your area, not anywhere near you.

Mr. RUSSELL. Well, yes; there was a plant there in Farrell, a hand type mill that operated part-time, but it has been down for the last 6 weeks, too. We don't know whether that will reopen or not.

Mr. PIKE. There wouldn't usually be many jobs left in the few left. The people who have got the mare going to hold onto them pretty strongly, I should think.

Dr. ANDERSON. Mr. Hook's statement was, "But actually there are still 750 of those mills in existence with approximately half in opera-

tion." That is three hundred-some-odd mills that require your skill are still in operation. Have you applied to any of those 300 mills to see if you can get a job?

Mr. RUSSELL. I don't know where they are at to get a job. I know in our district there aren't any in operation, so I wouldn't know where to go. They would probably be away off from our town, and I wouldn't have any means to get there to apply for work anyhow.

Mr. MURRAY. I think it might be well to make a distinction here, lest a wrong impression is created, a distinction between a plant and a mill. Mr. Hook said that there were some 375 mills still in operation. I think Mr. Hook might support me in saying that only affects some 40 plants, the 375 mills. And the distinction ought to be made there lest the impression be created that there are 375 huge hand-mill plants still in operation.

Dr. ANDERSON. Mr. Murray, where would those 40 plants be located?

Mr. MURRAY. I will endeavor to set that out for the benefit of the committee here during the course of my testimony. If the committee has no further questions to ask I am through with Mr. Russell.

(Mr. Russell was excused.)

GHOST TOWNS

Mr. MURRAY. The strip mills have reduced entire communities to ruin. Thriving steel towns have been converted into ghost towns overnight. New Castle, Pa., and that is the town Mr. Russell comes from, a steel town of 50,000 people, is a typical example. In the last 3 years 4,500 hand-mill workers have been permanently displaced in this town. A few years earlier 1,200 Bessemer steel workers were displaced in New Castle, a total of 5,700 victims of technology during the 1930's in a single steel town. As a consequence, private job opportunities have dried up. High-school graduates cannot find work, and are lucky to get an opportunity to go to a C. C. C. camp. Sixty-four percent of New Castle's population—7,000 families—have been receiving some form of State or Federal assistance, or have been trying to get such aid. The State and Federal Governments have been spending approximately \$3,250,000 a year in New Castle. But even as the plight of the town got worse, the Seventy-sixth Congress reduced W. P. A. wages \$5 a month and cut the number of W. P. A. jobs by more than 50 percent. I am submitting here a thorough study of New Castle made by the research department of the Steel Workers' Organizing Committee.

(The document referred to was marked "Exhibit No. 2478" and is included in the appendix on pp. 17332-17339.)

Mr. MURRAY. Other steel towns have likewise been reduced to ruin, while still others are on the verge of it. These towns are the victims of corporate irresponsibility. Boards of directors sitting in the financial centers of the Nation pass economic legislation, based exclusively on their profit-and-loss statements. In one decision they wipe out a complete mill and ruin an entire town, and they do it apparently without any thought of responsibility for the social consequences of their decision.

The record of the steel industry during the past decade in abandoning entire plants, or large departments of plants, in one knockout blow reveals an ignorance and disconcern of social conditions that

defy description. From 1929 to 1939, 53 old-style hand plate, sheet, and tin-plate plants have been permanently abandoned. Some of these plants were departments of large integrated steel works, but a large majority were separate plants. There were 38,470 workers displaced in these abandoned plants. I am submitting a list of these plants, indicating the parent firms, the location, products produced, and number of workers displaced in each plant by years. More than 50 percent of the workers were displaced in 1937 and 1938 with the result, as I shall point out later, that the effects of the strip mills on the volume of wages and employment in the steel industry have not been substantial until recently.

(The table referred to was marked "Exhibit No. 2479" and is included in the appendix on pp. 17339-17341.)

Mr. MURRAY. The strip mills are not through with their killing. Fourteen plants or departments of integrated steel producers are on the industry's death list. These old-style hand mills are scheduled to be abandoned permanently. Some of them have worked irregularly in recent years, and some are completely idle at present. Twenty-two thousand nine hundred and fifty workers are employed in these plants, soon to be thrown into the streets, to be made idle through no fault of their own, and no longer wanted by the steel industry or by private industry generally. I have a list of these plants. I feel it incumbent upon myself to refrain from adding any additional handicaps to the respective communities in which they are located, and to refrain from hastening the day of their final abandonment. Therefore I am not submitting the list of these plants to the committee, but if the committee would like to see the list I shall be glad to submit it in confidence. About the eventual abandonment of these plants, there is no doubt. Several steel employees have already discussed the abandonment of these plants with the Steel Workers' Organizing Committee. And with abandonment of these plants the number of prosperous steel towns will decline, while the number of ghost steel towns will increase. But the effects of the strip mills do not stop here.

The largest single step toward monopoly in the steel industry during the past decade has been the automatic strip mills. These expensive mills, which small companies operating the obsolete hand-mills cannot afford to install, are further concentrating the control of steel-producing facilities in the hands of fewer and larger companies. In the steel industry at present there are 18 small independent companies with obsolete hand mills, whose future is definitely limited. These companies employ a total of 23,350. Their combined capacity for flat-rolled products is 2,350,000 tons, or 15 percent of the industry's hand-mill capacity in 1929 for plates, sheets, black plate, or tin-plate.¹ Daily they are losing business to the strip-mill producers, and before long their entire business will have been gobbled up by the huge strip producers, and these small independent companies will have closed their doors for all times.

Thirteen of these 18 companies are under contract with the Steel Workers' Organizing Committee or another C. I. O. affiliate. The executives of these firms have told me and my associate officers, in the

¹ Directory of the Iron and Steel Works, Twenty-third Edition, 1938, American Iron and Steel Institute. (Mr. Murray's footnote.)

course of negotiations, that they do not expect to be able to stay in business much longer. I personally know that several of these companies would have closed their doors by now if it had not been for the revival in business of last fall. I, of course, have a list of these 18 small companies and shall gladly submit it to the committee in confidence, if the committee desires it, but I do not want to add to the credit, financial, and other difficulties of these companies by advertising their dire condition publicly.

With the strip mills firmly in the saddle, these small independent companies are doomed to extinction. The changes in the basing point system of pricing that were made in June 1938 have added to the difficulties of these companies, because their plants are located in one producing district. But even if these changes had not been made, the days of the small companies would still be numbered. The Steel Workers' Organizing Committee has not made any statement on these changes in the basing-point system of pricing, and it is not my purpose to comment on them as such. I merely refer to the observable effects of these changes in connection with the small steel firms I am discussing. The president of one of the small companies told me that the June 1938 changes merely cut a few months or years off the life of his company, that neither his company nor his competitors could hold out indefinitely against the automatic strip mills. Another president of a small company told me the only kind of business his plant has been able to get in the last several months is what the strip-mill producers will not handle. Since 1929, he told me, his company's share of the sheet business of the industry has declined more than 70 percent.

These companies are doomed, because their obsolete mills depend, in the main, upon manual power; while the automatic strip mills derive their power primarily from electricity. The difference in the cost of production is fatal to the smaller companies. Men cannot compete against electricity. This is plainly demonstrated by a comparison of the cost of producing a gross ton of tinplate, for example, on the hand mills with the automatic strip mills.

The CHAIRMAN. Mr. Murray, I must interrupt you, because that sentence, "Men cannot compete against electricity," by many would be interpreted as a statement on your part that you wanted to do away with electricity. I know you don't want to do it and I want to give you the opportunity to say so at this time.

Mr. MURRAY. Of course, I have already said, Mr. Chairman, that our committee and our organization and our whole C. I. O. movement, is in complete accord with technological advancement and progress, and the increasing of efficiency and productivity, and there is nothing here which I have made in this statement, I hope, that will create the impression in the public mind that there is any opposition being manifested by me against the introduction of electrical devices in industry today.

The CHAIRMAN. Your whole theory is that technological advance, the use of improved devices, the use of electricity, the use of all forms of power for industrial production, should be accompanied by some sort of social care for the workers and the businesses and the towns and communities which are affected by the change.

Mr. MURRAY. That is quite right. That is the basis of this presentation, as a matter of fact.

Representative WILLIAMS. Of course, what you are stating now is simply the effect that the introduction of these various modern appliances has had upon the working man in displacing him.

Mr. MURRAY. Quite true. I am trying to explain to the committee not only the devastating effect it is having upon the working man and his family, but the misery and poverty that is trailing in the wake of these things because of the manifestations of social irresponsibility indicated by these large corporations in meeting with Government and labor, and these other interested groups.

The CHAIRMAN. May I ask at this point, in your experience how many of the companies which employ the improved devices also endeavor by the payment of displacement wages or other separation allowances of any kind, to take care of the human factor?

Mr. MURRAY. There are no companies that I know of in the steel industry that are doing it. Perhaps Mr. Hook's company did that some 20 years ago; his company may be doing it today, I don't know.

The CHAIRMAN. He testified yesterday that he is doing it.

Mr. MURRAY. I understood he said he was doing so, but insofar as I am aware, I know of no single company or corporation manufacturing steel in this country today that is making provision to take care of these disappointed Americans that are being thrown out of American industry, in any way, shape, or form.

The CHAIRMAN. And with how many companies are you personally acquainted?

Mr. MURRAY. Well, I have collective bargaining agreements in 70 percent of the industry, with some 638 companies.

The CHAIRMAN. And your testimony is of 638 companies with which you have collective bargaining agreements, you know of no company which has adopted any separation allowance to take care of the displaced worker.

Mr. MURRAY. I know of none; none whatever.

Dr. ANDERSON. In the companies with which you do not have bargaining agreements do you know of any such arrangements?

Mr. MURRAY. No, I know of no such arrangements anywhere in the steel industry, none whatever.

Representative WILLIAMS. I take it you haven't any agreement with Mr. Hook's company, the American Rolling Mill Co.?

Mr. MURRAY. No, Mr. Hook is an affable gentleman when he appears before the committee but a different type of gentleman when he appears back in Middletown.

The CHAIRMAN. Now, Mr. Murray!

Representative WILLIAMS. I didn't mean that, but he said he had such an arrangement and you wouldn't know about that. That is why I said, you evidently haven't an agreement because he said he had the arrangement and you said there were no arrangements.

Mr. MURRAY. No, as far as I know, Mr. Hook has no desire to talk to me. I am quite willing to talk any time he wants to.

Representative REECE. If I may revert to page 3 which was read before I came in, I notice on line 3 in speaking of the industrial conditions existing at that time you say:

Unemployment might very well be likened to the attitude of leading industrialists and Republican statesmen during the period 1930 through 1932, when they said that a policy of waiting would result in a return of prosperity.

Then you go on and say:

The attitude of industrialists and certain statesmen of today concerning the solution of the present unemployment problem is the same.

Do you have any particular reason for designating "Republican" statesmen in one case and "certain statesmen" in the other?

Mr. MURRAY. Nothing other than the fact we had a Republican administration way back there and I was making an indirect reference to the chickens in pots and cars in garages back there, and that was about the only suggestion that was offered in those days, so far as I know, to cure the unemployment conditions of some 5,000,000 citizens who were idle then.

Representative REECE. But you say the same suggestions have been offered at this time by industrialists and certain statesmen. Now we don't have a Republican administration today and I was wondering why you used party reference in one instance and not in another, since we are dealing with purely an economic situation here in which, of course, party consideration has no relationship.

Mr. MURRAY. Well, I am sorry if the implications have created the impression in your mind that this dart was directed at the Republican Party, because I certainly did not mean it that way. I simply meant we had a Republican administration back there, and that the only cure they suggested then was to wait. Now I don't see anybody waving their arms in the Federal Congress today about this unemployment situation—just nobody at all.

The CHAIRMAN. Oh, well; look at the chairman, will you please, and say, "Yes, there is somebody."

Mr. MURRAY. Well, perhaps they are not making public the things you are saying, Chairman O'Mahoney, but I would be delighted if this Congress would get exercised about this situation and do something about it. That is how I feel about it.

The CHAIRMAN. Of course it may be appropriate to say that the organization of this committee was in itself a very definite attempt to bring about a solution of this question. I may say that as long ago as 1935 I introduced a bill in Congress which in its terms called for just such an industrial conference on unemployment and economic conditions as you mentioned a little bit earlier, and I am glad to be able to say that there are a number of Members of Congress, both Democrats and Republicans, and others also, who are not affiliated with either party, who are seriously concerned with this question of unemployment.

Mr. MURRAY. I think it might be well to say there, Senator O'Mahoney—

Senator KING (interposing). Let me supplement what was said by the chairman, if you will pardon me. I agree with what the chairman has stated, and I understand this committee is charged with the responsibility. At least I so interpret our mandate, to inquire into our economic and industrial situations and to make such recommendations for the alleviation of the situation as the evidence justifies. And I am waiting anxiously to hear what you have to suggest as an antidote for these evils, and what you have to suggest as a means to alleviate the conditions.

Mr. MURRAY. I think it might be well, Mr. Chairman, for me to say to the committee that there is nothing in this statement that can be

construed as disparaging insofar as the committee here is concerned, because I have the greatest admiration for the work which the chairman of the committee has been doing in promoting a better understanding of thousands of industries and endeavoring to ascertain through the means of these hearings what it is that groups of citizens are doing about it.

The CHAIRMAN. I didn't mean to imply you were disparaging the work of the committee, or indeed of anybody. I was merely bearing out what I understood to be your attitude, that in this reference you didn't mean to make any invidious comparison.

Mr. MURRAY. That is right.

The CHAIRMAN. We have a problem. It wasn't solved in 1932 and prior thereto, and it hasn't particularly been solved yet. As a matter of fact, we only have W. P. A. to provide a little bulwark against complete disaster for men like the human exhibit that you brought here this morning in the person of Michael Russell.

COST OF PRODUCTION IN MECHANIZED MILLS

Mr. MURRAY. I stopped at that place, Mr. Chairman, that men cannot compete against electricity. This is plainly demonstrated by a comparison of the cost of producing a gross ton of tin plate, for example, on the hand mills with the automatic strip mills. The following cost of production figures were given to me in confidence, and I cannot divulge the companies involved. The standard measurement of tin plate is a base box amounting to approximately 100 pounds. The total cost of production of a base box of tin plate on hand mills is \$4.72. Of this cost, labor amounts to \$1.52. I am submitting a table, "Cost of Production of Tin Plate on Hand Mills," giving the full details of these costs.

(The table referred to was marked "Exhibit No. 2480," and is included in the appendix on p. 17341.)

Mr. MURRAY. The total cost of production of a base box of tin plate on an automatic strip mill is \$3.91. Of this cost, labor amounts to \$0.643 per base box, a reduction of 57 percent from the labor cost on the hand mills. Other strip-mill items of the cost of production amount to \$0.067 per base box more than on the hand mills, particularly because of higher depreciation charges. Thus the strip mills can produce tin plate \$0.808 a base box cheaper than can the hand mills. This amounts to a savings on the strip mills of \$17.77 per gross ton. This difference is so great that the integrated steel companies have almost completely abandoned their hand mills, and thus four small tin plate companies with only hand-mill facilities freely admit that they will be compelled to go out of existence in the near future.

The CHAIRMAN. Do you happen to know what the employment is of white-collar workers in these mills of which you speak that are about to go out of existence?

Mr. MURRAY. The percentage of the whole?

The CHAIRMAN. Yes.

Mr. RUTTENBERG. The ratio is about 10 percent salaried and white-collar workers, one salaried or white-collar worker for nine laborers.

The CHAIRMAN. The picture you are drawing is not only of the displacement of the day worker or the hourly rate worker but also of

the displacement of white-collar workers and the injury of independent producing companies and also the injury of the communities in which they operate, so I want to know how many of these white-collar workers might be involved in this movement that you are describing.

Mr. MURRAY. That is quite true; there is, and might I follow through at that point and explain to the committee another situation that develops in connection with the maintenance of these dying hand mills or obsolete or antiquated mills. The hand mill desires, of course, to live, it wants to live, it fights to live; it knows that life to it is a question of the survival of the fittest in the great competitive field. It cannot compete and pay the same wage that is paid at the low-cost, high-producing, more efficiently managed big mill, with better machine facilities. The employer who owns the small hand mill comes in a state of desperation to the organization and says, "Give me a chance to live, won't you? Help me along. Won't you agree to a cut in our wage rates here so that we can live for another 2 or 3 months?"

Now, there is an economic repercussion that runs through this distorted competitive picture in the steel industry today that constantly confronts the workers employed in the industry, reducing their social standards, to meet these newer conditions created by the production of these large continuous mills.

Mr. CHANTLAND. Mr. Murray, if your figures are right, the hand-mill cost on a base box of tin was \$4.72 and the strip mill was \$3.91.

Mr. MURRAY. That is right.

Mr. CHANTLAND. Representing a savings between the two processes of 81 cents a box, while the savings on labor or the reduction in labor was \$1.52 and \$0.64, or 88 cents, so that the reduction of labor was 7 cents more a box than the total savings?

Mr. MURRAY. Perhaps my expert can explain that to you, but it is my understanding that in arriving at that figure he was trying to determine the difference in the actual labor cost, and the figures showed a difference in labor cost amounting to approximately 88 cents, although the over-all cost may have been only 80.

Mr. CHANTLAND. That is right. Reduction in labor is greater than total saving.

Mr. MURRAY. No; I think that the reduction in labor is a distinct situation from the one to which you make reference, and I believe that Mr. Ruttenberg can answer that.

Mr. RUTTENBERG. The total difference is between \$3.91 on the strip mill and \$4.72 on the hand mill; it is a reduction of a total of approximately 88 cents, of which 80 cents is reduction in labor costs.

Mr. MURRAY. Does that explain it?

Mr. CHANTLAND. Then your total cost of the strip mill is \$3.91.

Mr. HINRICHS. You don't give the detail in that exhibit for the costs of the strip mill, but I think that the steel cost would be the same in the two types of mill and the tin cost would be the same in the two types of mill, and the materials and supplies essentially the same.

Mr. RUTTENBERG. The reduction is almost exclusively in the labor costs.

Mr. HINRICHS. And the increase of 6 cents that you mention is almost entirely the depreciation item.

Mr. RUTTENBERG. That is right.

Mr. HINRICHS. That would mean, then, that if these hand mills were to stay in business in competition with the automatic strip mill, if the hand mills disregarded that whole depreciation item of 12 cents, which is the only capital charge in the thing, if they regarded their equipment as worth absolutely nothing and didn't charge any depreciation, but just mined it out and cut their wages more than in half, they still would not be effectively competing with the automatic process. Is that correct?

Mr. RUTTENBERG. That is so true that virtually every hand mill that produces tin plate for the integrated companies that have strip mills is down, and they are producing on the strip mills.

Mr. HINRICHS. And that process could be kept alive only up to the point where the machinery itself couldn't be used any longer if you didn't maintain any depreciation.

Mr. RUTTENBERG. They would live as long as they had any fat to live on and when they didn't have that they would have to close their doors.

The strip mills' advantage in producing sheets is even more fatal to the hand-mills. An official of a small hand-mill sheet producer told me his direct labor cost to convert a ton of billets into sheets for 13-gage sheets, which is his average, amounted to \$6.50 a ton, plus \$1.30 a ton for indirect labor costs, or a total labor cost of \$7.80 per ton of sheets. The strip mills have reduced the over-all cost of production of sheets and strip, according to Mr. Eugene Grace, president of the Bethlehem Steel Corporation, by \$6 to \$8 a ton.¹ Thus, if the entire labor cost on the sheet hand mills were eliminated, the cost of production would still exceed that of the automatic strip mills. In other words, even if the hand-mill workers donated their labor to the small hand-mill companies, they still could not successfully compete with the automatic strip mills. Certainly with such a wide difference in the cost of producing sheets, wage sacrifices on the part of the hand-mill workers will not save either their jobs or the companies that employ them. As a matter of fact, all of the 14 small, hand-mill sheet companies pay wages at present that are below the prevailing wages in the steel industry, and they cannot be reduced further.

Efforts of these small companies to reduce their costs and remain competitive have been exhausted. Several of these companies have installed three-high semiautomatic mills for the production of sheets. These mills eliminate around 1 out of every 5 workers required to produce an equivalent tonnage on the hand mills, and reduce the over-all cost of production \$4 per ton of sheets, on the average. The effect of the semiautomatic mills is to prolong the life of the companies that install them, but the savings of these mills are not enough to enable the companies that have them to compete indefinitely against the strip mills. The president of the small sheet company, which first installed semiautomatic mills, told me more than a year ago that if he could keep his company alive for another 4 years he would be satisfied.

Prior to the installation of semiautomatic mills, the small sheet mill companies, particularly during the twenties, pared their costs to a bone. As an example, I am submitting a noteworthy study of employment and productivity in a sheet-steel mill, by a thoroughly

¹ *Wall Street Journal*, July 28, 1939.

competent student, Dr. J. R. Gruener. This is the only copy we have of the book, but there is a summary in the paper.

The CHAIRMAN. We will be glad to have it for the files.

(The book referred to was marked "Exhibit No. 2481" and is on file with the committee. The document summarizing this book was marked "Exhibit No. 2481-A" and is included in the appendix on pp. 17341-17342.)

Mr. MURRAY. This is a printed volume of some 80 pages. This study, based on the company's own records, briefly summarized shows, as a result of technological improvements made from 1925 to 1929, the company eliminated 312 workers and reduced man-hours by 47 percent, but its monthly pay roll by 34 percent, or \$34,816, and still increased its production by 13 percent. In other words, the hand-mill companies had reached their peak of efficiency when the strip mills were developed, and they are helpless before the onslaught of the low-cost automatic strip producers, as hand-mill costs cannot be slashed any more.

The economic effects of the strip mills, therefore, are the elimination of the smaller companies, and the further concentration of steel-producing facilities in the hands of the few large steel companies. The new steel technology is accentuating monopoly in the steel industry.

The CHAIRMAN. It is now 12:15 and you still have some time to go, so we will postpone the rest of your statement, if you have no objection, until the afternoon session. I was going to ask, however, whether in the matter that is still to be presented you intend to deal with the statement which has been made that though there has been this big advantage in technology through the introduction of the continuous mill and workers have been as a result necessarily displaced, they have by and large been absorbed in new industry or in avenues that have been created as a result of the improvement. Do you deal with that subject later?

Mr. MURRAY. We deal with the failure of industry to reabsorb or new enterprise to absorb.

The CHAIRMAN. The committee will stand in recess until 2:15.

(Whereupon at 12:15 the committee recessed until 2:15 p. m.)

AFTERNOON SESSION

(The hearing resumed at 2:20 at the expiration of the recess, Chairman O'Mahoney presiding.)

The CHAIRMAN. The committee will please come to order. You ended just before you got to New Steel Technology Covers Industry of your prepared statement.

TESTIMONY OF PHILIP MURRAY—Resumed

Mr. MURRAY. With your permission, Mr. Chairman and members of your committee, I would like to expedite the reading of this paper by asking that with the beginning of our subject dealing with New Steel Technology Covers Industry on page 18, running over to the last paragraph on page 21, all of this matter which I won't read unless you insist upon my reading, be included in the record.

The CHAIRMAN. That is a very customary request in the House of Representatives. All you are asking is for leave to print. We will grant it.

Mr. MURRAY. Then the matter which I refrain from reading deals largely with the individual displacements of perhaps one, two, or three men on jobs, and it will be interesting, I suppose, for the guidance of the committee in their final determination of the facts to be presented.

The CHAIRMAN. That material will be printed in the record as part of your statement in the order in which it appears in the statement itself.

(The omitted portion of Mr. Murray's printed statement appears below:)

NEW STEEL TECHNOLOGY COVERS INDUSTRY

The new steel technology has been displacing labor in all branches of the steel industry, and has not been confined to the production of flat-rolled products. The cumulative effect of all the technical improvements made in the steel industry during the past decade, some small, others large, has been so severe on employment as the huge, dramatic technical improvement of the automatic strip mill. I shall not impose upon the time of the committee by relating all of these smaller technical improvements, but I do feel it is important to recite a few typical ones briefly. I have chosen the following cases of relatively small technical improvements from our files at random, as illustrative of what is happening in every one of the branches of the steel-producing industry.

Case No. 1: A large steel company, firmly established in the trade, invested \$750,000 in improvements in its open-hearth department. Sixty-two employees were eliminated in the department as a result of the improvements, which amounted to an annual pay-roll saving of \$118,000. In addition, the company effected savings in coal consumption and other savings, which amounted to \$257,000 a year. Thus the company's annual savings in cost totaled \$375,000, or enough to write off its \$750,000 investment and interest in less than 2½ years. The technical improvements enabled the men remaining on the pay roll—and recall that 62 were eliminated—to produce in 133 days the same amount of steel that formerly required 200 days. The result was that even though the men made more money per hour, their over-all annual earnings remained the same, as the number of hours of work a year was reduced correspondingly with the increased tonnage per hour. Incidentally, the company sought a reduction in tonnage rate, but the S. W. O. C. rejected the company's request for the reason stated above.

This case illustrates how the employment year of steel workers is being reduced. Increased mechanical efficiency means steel workers no longer can look forward to 5 days' work a week for 50 steady weeks a year; in fact, a steel worker is lucky if he is employed 75 percent of the year.

Case No. 2: One of the industry's largest wire companies, through technical improvements, increased the speed of its cold wire drawing machines from 115 revolutions per minute to 150. As a consequence production rose from 2,185 pounds per 8-hour turn to 3,000 pounds per turn, or an increase of 37 percent. Here again the company sought to reduce tonnage rates from 14 to 22 percent. Production had been increased to such an extent, it was argued, that the employees involved would be able to increase their daily earnings by 7.2 percent, despite the 14 to 22 percent proposed cuts in their tonnage rates. The S. W. O. C. maintained in this case, as in the open-hearth case I have just discussed, that daily earnings are not a fair measurement, because the annual earnings of the men were reduced in direct proportion to the increase in their output per hour. Tonnage wage rates were adjusted to the mutual satisfaction of the company and S. W. O. C., recognizing the principle that workers should participate equally with the company, directly and immediately, in the benefits of technology. In another case, a wire company in its fine-wire department increased the revolutions per minute of its machines from 350 to 450, or 28 percent. Production rose from 1,200 to 1,800 pounds per 8-hour turn, or 50 percent. Here again the 12-month employment year was cut at least by one-fourth.

Case No. 3: Large numbers of men have been eliminated in the primary operations of the steel industry by the introduction of the scarfer. Scarfers.

with their acetylene torches, can burn the bad seams out of billets 3 to 5 times as fast as chippers can chisel them out with their air-pressure chisels. In the steel foundry of the Bethlehem Steel Co., Bethlehem, Pa., five to six chippers formerly worked 8 hours each to clean the scale from a certain product, at a total labor cost for this one operation of \$31.20. Now one man with an acetylene torch and one helper does this same job, at a total labor cost of \$10.08, or a reduction in the total labor cost of 70 percent. At least 2,500 workers have been eliminated in the steel industry during the past decade in the shift from the chipping to scarfing method for taking bad seams out of slabs, billets, etc.

Case No. 4: There are technical improvements that eliminate as few as 1 worker, or 3 on 3 shifts. In the blooming mill department of a large steel works 1 man was employed as a stamper on each operating shift. His duties were to place small metal numbers in the slot of a stamp hammer, and to strike the billet with the hammer to imprint the heat number for identification purposes. This job, affecting 3 men, 1 on each shift, has been eliminated. Now a small air-controlled cylinder directly above the hot billet has been installed. It is controlled by a switch placed near the shearman who operates it along with his other duties with no extra compensation. The heat numbers are changed by the production recorder, who likewise does not receive any extra compensation for his increased duties. Countless cases of this description can be related. I can cite numerous other cases, and the story is the same: 1 man here, 3 men there, 12 men here, etc., are being displaced by technical improvements. The effects of these improvements have been that fewer and fewer workers and less and less man-hours are required to produce more and more steel products.

Mr. MURRAY. Might I summarize this by beginning on the last paragraph of page 21: All this means irregular work for the steel workers who are considered regularly employed. They might work 5 days a week for a month, or for 2 months. Then they will be employed 4 days a week, or 3 days a week for a month or more. As the year goes on they might get 5 days' work a week for a few more months. Then they might be laid off for a week, sometimes for a month or more. A pick-up in business comes. They are called back, and are employed 5 days a week for a while. They might get 6 days a week for a couple of peak weeks of production. Then they go down to 3 and 4 days a week work. All this adds up to partial employment for the entire year. Steel workers who are considered regularly employed suffer periodic unemployment or slack employment every year. The number of steel workers who are employed a full 5 days a week for 50 weeks a year is insignificant. The vast majority of workers attached to the steel industry are affected adversely by the increased technical efficiency of the industry. Instead of being employed a full year, the average steel worker is idle from one-fifth to two-fifths of the year, and only employed from 60 to 80 percent of the time. Because in this time all the steel consumed for the entire year can be produced.

The CHAIRMAN. The conditions which you have just described as existing in the steel industry are very similar to those which exist in the coal-mining industry, are they not?

Mr. MURRAY. In the coal industry, of course, that industry is keyed with men enough, invested capital enough, and coal mines enough, to produce approximately 850,000,000 of coal annually, where the consumptive requirements of the Nation are reduced to something approximating 400,000,000 tons now. The coal industry on the basis of its present industry set-up only affords about half time to all of the workers employed in that industry. In the steel industry, according to our analysis of the whole thing throughout the past 10 or 11 years, we find that, due to the introduction of new machines, improvements in

efficiency, and other technological improvements, the steel industry is equipped today with men and money and plant-equipment facilities to produce approximately all of the Nation's ordinary normal 1929 requirements on about $7\frac{1}{2}$ months' work each year.

The CHAIRMAN. I was about to say—

Mr. MURRAY (interposing). And that situation, of course, is becoming worse from the standpoint of the introduction of new machines constantly in the industry, providing only part-time employment for those who are kept in industry, and, of course, as I have already stated, displacing some 88,000 people from the industry within the next 2 years.

Representative WILLIAMS. That would mean an average employment of men about 7 or 8 months a year?

Mr. MURRAY. That is right, on the basis of 5 days per week and 40 hours.

The CHAIRMAN. Well, in terms of unemployment during the week and during the year I could have imagined that you were describing conditions in the coal-mining areas of my own home State.

Mr. MURRAY. Quite true. What is true in Wyoming is true in Pennsylvania, true in Illinois.

The CHAIRMAN. And when the worker who constitutes the bulk of the population, of the coal-mining population, or a steel-producing community, is unable to work but a portion of the time, his lack of purchasing power is felt not only by the businessmen of the particular community but also by your whole economy; isn't that right?

Mr. MURRAY. Quite true, and, Senator, I want you to know that the interest that we are manifesting in endeavoring to effect a cure for these bad economic conditions is prompted wholly and very unselfishly to help not only industry but the community and the State and the Nation as well. We believe what we are offering here in the introduction of factual matter dealing with unemployment in steel is not something that is promoted by my union to immediately help my union, but rather to help the industry, to stabilize the functioning end of the industry, and to help the community and the Nation as well.

The CHAIRMAN. It is all keyed into the purchasing power of the masses, as was testified here by Mr. Ford and Mr. Kettering a few days ago, and when we build up that purchasing power by stable employment at real wages we increase the market for every businessman in the land, do we not?

Mr. MURRAY. That is right.

Now with your permission, Mr. Chairman, on page 22 I should like to eliminate from the reading of the paper that portion of the paper that deals with mergers and consolidations and merely again to summarize by referring to the last paragraph of that article on page 23.

(The omitted portion of Mr. Murray's printed statement appears below:)

MERGERS AND CONSOLIDATIONS

Included in the new steel technology are savings resulting from mergers of steel companies and consolidations of subsidiaries of the larger steel producers. During the thirties United States Steel consolidated the Illinois Steel Co., Carnegie Steel Co., Lorain Steel Co., and the American Sheet & Tin Plate Co., all subsidiaries, in the Carnegie-Illinois Steel Corporation. The West Leechburg Steel Co. merged into the Allegheny Steel Co. in 1936, and 2 years later the Ludlum Steel Co. merged with the Allegheny Steel Co. into the Allegheny-Ludlum Steel Corporation. The Republic Steel Corporation absorbed the Corrigan-McKinney

Steel Co. and the Canton Tin Plate Corporation; and the Truscon Steel Co. merged with Republic. The Seneca Iron & Steel Co. was merged into the Bethlehem Steel Co. and later consolidated along with the Pacific Coast Steel Co., Southern California Iron & Steel Co., and the McClintic-Marshall Construction Co. The number of steel companies going out of existence during the thirties as a result of mergers and consolidations by the major steel producers was 18, while 8 others were merged but have kept their separate identities. Only 2 new companies were formed as a result of these mergers and consolidations, all of which are listed in exhibit No. 2482, which I am submitting.

In addition, there have been other managerial improvements, like systems of budgetary control, etc., that have been introduced in the steel industry in recent years, the net effect of which has been to contribute to a shrinking labor force. This has also been the effect of the mergers and consolidations that took place in the steel industry during the past decade.

Dr. ANDERSON. Mr. Murray, do you want to introduce the exhibit?

Mr. MURRAY. I want to introduce the exhibit and I want to introduce all of the other material in the record for the guidance of the committee.

Dr. ANDERSON. The exhibit then will be "Exhibit No. 2482."

The CHAIRMAN. It may be received.

(The table referred was marked "Exhibit No. 2482" and is included in the appendix on pp. 17342-17343.)

Mr. MURRAY. I endeavor at this point to impress upon the committee the fact that these mergers and consolidations that have taken place in the steel industry within comparatively recent years are in some measure, or do in some measure contribute toward the unemployment situation in the steel industry through the promotion of greater efficiencies and the centralization of the operating efficiencies of the management. I continue by stating:

The net effect of the automatic strip mills, of other technical improvements, of mergers, consolidations, and the like—in brief, of the new steel technology—has been an increasing volume of technological unemployment in the steel industry during the 1930's.

I come now to the statistical measurement of technological unemployment in the steel industry. There are two ways to measure employment. One is in total employment, or the number of wage earners. The other is in man-hours, or the number of hours worked. The latter (man-hours) is the more accurate measurement of employment, from the point of view of both the employer and labor. The number of wage earners at any given time is not an accurate measurement of employment. From labor's point of view the number of wage earners may be too high for the given production because of part-time work, as no consideration is given to the effect of sharing the work on actual working time. From the employer's point of view the number of wage earners may be too low for the given production because of overtime work, as no consideration is given to the extra days actually worked. On the other hand, man-hours, the actual number of hours worked to produce a given output, gives consideration to part-time work and overtime work. Finally, the changes in the number of hours worked per week, as these changes affect employment, can be seen only by man-hour comparisons.

Thus in measuring employment, it is obvious man-hours is a far more accurate picture of the volume of employment than is the number of wage earners. In other words, the volume of employment in man-hours in relation to production is the real way to get at the heart of the problem of technological unemployment.

I am submitting here a chart, "Pay Rolls and Man-Hours per Ton of Output."

The CHAIRMAN. It may be received.

(The chart referred to was marked "Exhibit 2483" and appears on p. 16483.)

Mr. MURRAY. This is a chart showing the trend of pay rolls and man-hours per ton of output of hot-rolled iron and steel products in the steel industry from 1923 through 1939. This chart is based on figures from the National Industrial Conference Board, a private statistical agency whose board of directors is composed of leaders of industry.¹

This chart shows that since 1923 the number of man-hours per ton of steel output has declined 36 percent. In other words a little more than 6 steel workers can turn out as much steel now as 10 could in 1923. The decline has been most severe since 1936, when the huge labor displacement by the automatic strip mills began. Almost half of the decline has taken place since 1936.

The impact of the new steel technology on pay rolls demonstrates why our economy is in a rut. Pay rolls per ton of steel produced have declined 10 percent since 1923. In other words, the labor cost per ton of steel produced now is 10 percent less than in 1923. This 10-percent reduction was made from 1924 to 1929, during which time hourly wage rates remained unchanged. The labor cost per ton of steel now is approximately the same as in 1929; that is, the index of pay rolls per ton of output on this chart stands at 89.4 in 1929 and 90 in 1939. During the same period, however, from 1929 through 1939, average hourly earnings increased 29 percent, or from 65.4 to 84.2 cents per hour.² Thus during this 10-year period total pay rolls for a comparable output remained the same despite an increase of 29 percent in hourly earnings. Technological improvements are responsible for this condition. It is plainly observable, therefore, that labor is not participating in the benefits of the new steel technology.

A full-view effect of this technology, however, on pay rolls and employment can best be had by looking at the last 4 years in the steel industry.

The CHAIRMAN. Is that statement disputed by any observer of the steel industry?

Mr. MURRAY. Might I say for your information, Mr. Chairman, that this statement which I now read is largely derived from figures produced by the American Iron and Steel Institute, the National Industrial Conference Board, and from other private and statistical agencies with whom we have no connection, and in addition to that based upon factual studies of all those matters by my own department of research in the city of Pittsburgh, which has made a current review lasting now for a period of approximately 5 months, into all of the factors having to do with this question that I now present to the committee.

Mr. PIKE. I think, Mr. Murray, that your statement is almost exactly true in dollars and cents, and I think Mr. Hook's figures yesterday bore it out pretty well, but they at least have gained in

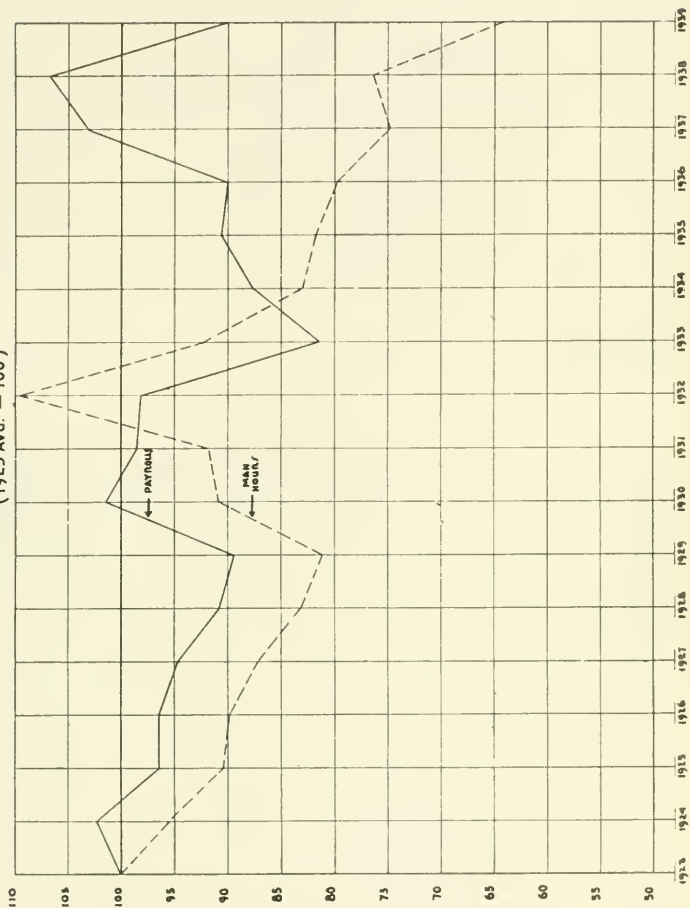
¹ *Iron and Steel*, January 1940, National Industrial Conference Board, page 6. (Mr. Murray's footnote.)

² *Steel Facts*, February 1940, American Iron and Steel Institute, page 3. (Mr. Murray's footnote.)

EXHIBIT No. 2483
IRON & STEEL INDUSTRY
PAYROLLS & MAN-HOURS PER TON OF OUTPUT
SOURCE: NATIONAL INDUSTRIAL CONFERENCE BOARD
(1923 AVG. = 100)

EXHIBIT No. 9

KEY: SOLID LINE — PAYROLLS PER TON OF OUTPUT
DASHED LINE — MAN HOURS PER TON OF OUTPUT



several hours a week of leisure which they didn't have before. If there is any gain, it is in more off time a week rather than in dollars and cents.

Mr. MURRAY. Of course, my complaint here is predicated upon the assumption that there is too damned much leisure in the steel industry. I don't think that they are giving them enough work. If your mind is meeting my mind, and I doubt that it is, of course we are both right.

Mr. PIKE. We would agree that 70 hours a week was much too much for a man to work over a long period, and that there was a real desirability for social reasons to pull those hours down first, say, to 60 and then to 54 and to 48 and possibly to 40, but somewhere in there comes the question of when you have got too much time on your hands and I am interested to get your point of view. Would you only ask, then, for 30 hours in order to spread the work more, and not because 30 hours would be better for the men?

Mr. MURRAY. Well, I intended of course to cover that phase of it in the later discussion of this problem.

Mr. PIKE. All right.

Mr. MURRAY. Is it all right if I shoot it in a little later?

Mr. PIKE. Yes.

GREATEST CHANGE IN EMPLOYMENT AFTER 1936

Mr. MURRAY. The most vital period during the thirties has been from 1936 through 1939. It is during this period that hourly wage rates rose more than 26 percent; that is, of the 29-percent increase since 1929, most of it took place since 1936. The new steel technology of the thirties did not begin to reduce pay rolls and employment, in substantial amounts, until 1936. It is since then that the productive efficiency of the industry increased by 21 percent. During this period wages per ton of ingots produced rose as a result of the increase in hourly wage rates, but by the end of the period, in September 1939, wages per ton of ingots produced had returned to the level prevailing before the increase in hourly earnings. From August 1936 to September 1939 technology reduced the number of man-hours per ton of ingots produced from 18.7 to 14.7, or more than 21 percent.

These facts were arrived at through careful and extensive analysis of the basic facts compiled by the American Iron and Steel Institute on monthly ingot production, total monthly hours worked by hourly, piece work, and tonnage workers, and total monthly wages (in whole dollars) received by this group of steel workers. I am submitting an explanation in "Exhibit No. 2484" of the nature of these basic facts and the method of their analysis.

The CHAIRMAN. It may be received.

(The document referred to was marked "Exhibit No. 2484" and is included in the appendix on p. 17343.)

Mr. MURRAY. I am also submitting four charts that illustrate these facts. I then make reference to the charts which are "Exhibits Nos. 2485, 2486, 2487, and 2488."

The CHAIRMAN. They may be received.

(The charts referred to were marked "Exhibits Nos. 2485 to 2488" and appear on pp. 16485-16488.)

EXHIBIT No. 2485

EXHIBIT No. 11

IRON & STEEL INDUSTRY
MAN-HOURS - PER TON OF INGOTS PRODUCED

Source:

AMERICAN IRON & STEEL
INSTITUTE

Illustration:

A TWENTY ONE AND FOUR TENTH PER CENT DECLINE IN MAN-HOURS, FROM 18.7 TO 14.7 MAN-HOURS PER TON, TOOK PLACE FROM AUG. 1936 TO SEPT. 1939. DURING BOTH THESE MONTHS THE RATE & QUANTITY OF INGOT PRODUCTION WERE ALMOST EQUAL.

Method:

TOTAL MONTHLY HOURS WORKED BY HOURLY, PIECE WORK, & TONNAGE EMPLOYEES DIVIDED BY OPEN HEARTH & BESSEMER STEEL INGOTS PRODUCED MONTHLY.

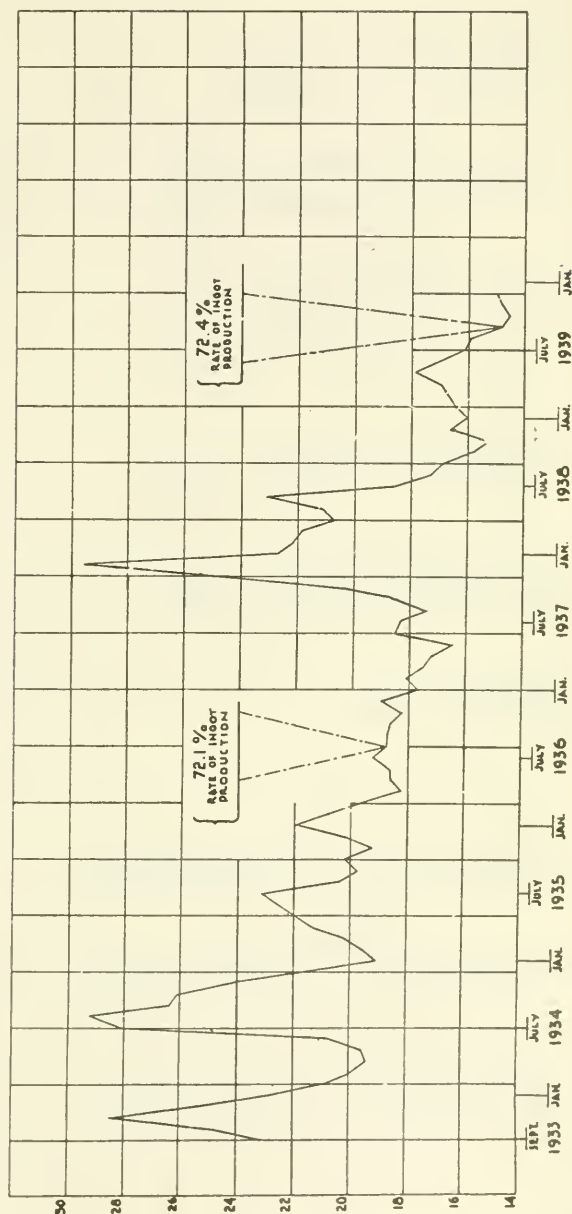


EXHIBIT No. 2486

IRON & STEEL INDUSTRY

EXHIBIT No. 12

WAGES - Per Ton of Ingots Produced

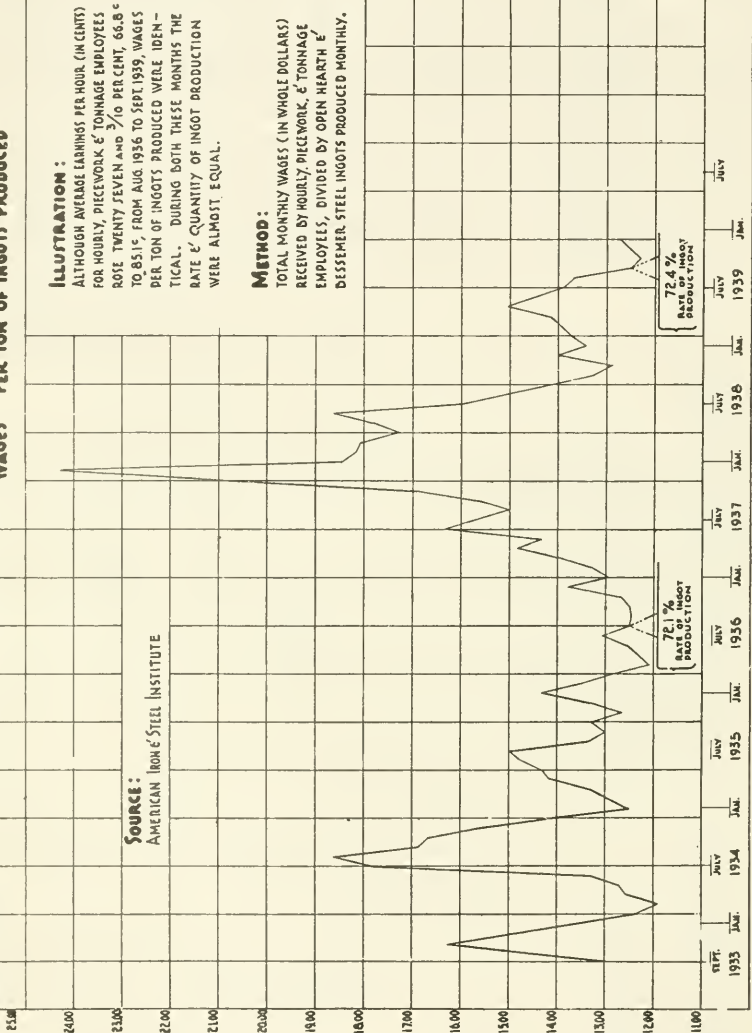


EXHIBIT No. 2487

EXHIBIT No. 13

IRON & STEEL INDUSTRY

RELATION OF PRODUCTION TO PAYROLLS (AT 72% TO 76% OF INGOT CAPACITY)

SOURCE: AMERICAN IRON & STEEL INSTITUTE

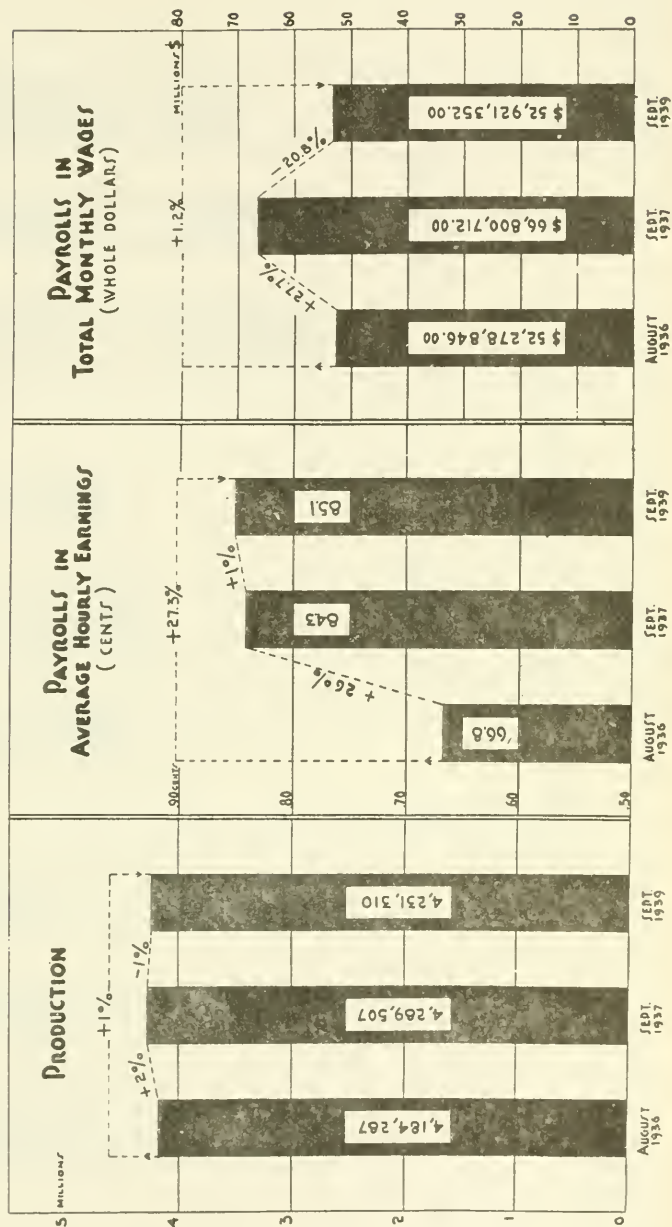


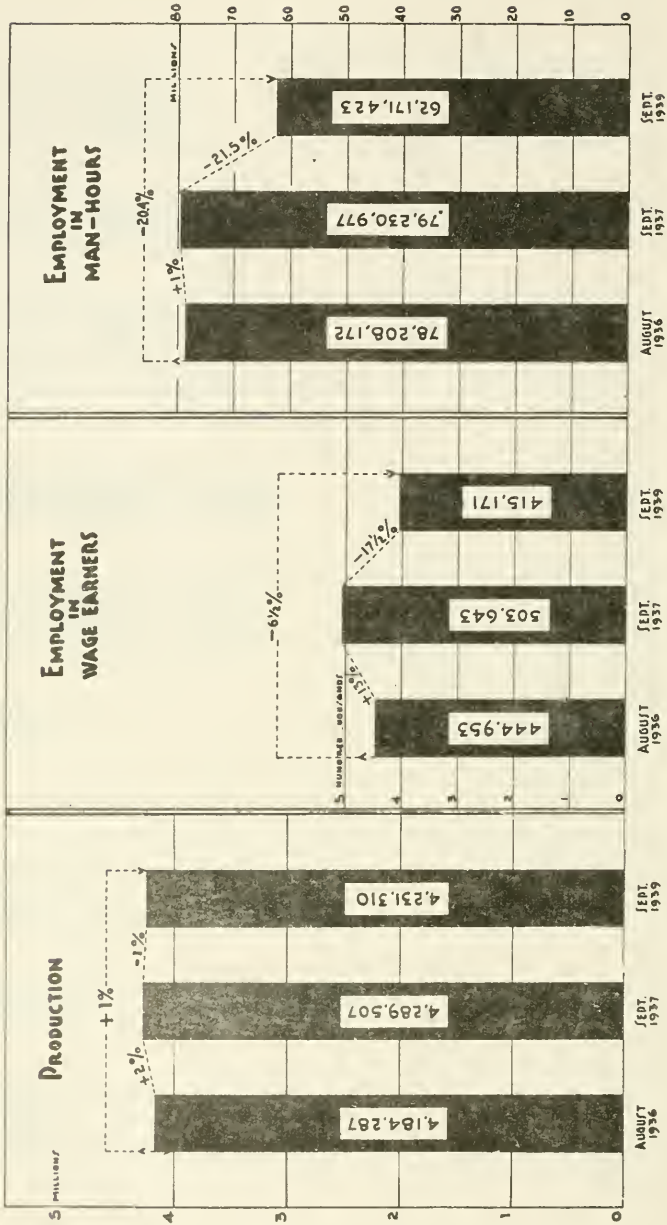
EXHIBIT No. 2488

IRON & STEEL INDUSTRY

EXHIBIT No. 14

RELATION OF PRODUCTION TO EMPLOYMENT (AT 72% TO 76% OF INGOT CAPACITY)

SOURCE: AMERICAN IRON & STEEL INSTITUTE



Mr. MURRAY. I am submitting this explanation and illustration of the facts as exhibits to avoid consuming the committee's time on technical matters, and if after looking these facts over any committee members want to discuss them with me or the S. W. O. C. research staff, we shall gladly oblige.

In connection with this body of information I want to discuss, briefly, three important questions. One is the relation of hourly earnings of steel workers to steel prices. The second is the relation of the new steel technology to national purchasing power. And the third is employment.

Might I just take the time of the committee while I present one of those charts?

(Senator King assumed the Chair.)

Acting Chairman KING. Which exhibit is that?

Dr. ANDERSON. "Exhibit No. 2488."

Mr. MURRAY. I wanted to make a comparison here because I think this is graphic and describes in vivid fashion just about what our situation is today in the industry. You will note at the left side of the chart there the August output of 1936, 4,184,287 tons. September 1937 there was an increase of 2 percent over the August 1936 production, or 4,289,507 tons. In September 1939 there was a drop of 1 percent below the 1937 production to 4,231,310 tons. Those are three fairly comparable months.

You will note here in the middle of the chart reference is made to the number of employees in those particular periods.

In August 1936, 444,953 employees produced the 4,184,287 tons. I want to explain this figure here. In March of 1937 the Steel Workers Organizing Committee negotiated the agreement with the steel industry reducing the workweek from 46 to 40 hours. That condition necessitated the employment of an additional 58,000 workers, bringing the total number of employees in the steel industry in March of 1937 up to 503,643.

Acting Chairman KING. That is the entire United States?

Mr. MURRAY. In the United States. In September of 1939, 2 years later, when the full impact of technological improvement was beginning to be felt, this force of 503,643 workers employed in September of 1937 producing a comparable tonnage to that of September 1939, we find the industry in September 1939 giving employment to 415,171 workers, or, as you will note, a reduction in the working force approximating 88,000 below the September 1937 figure.

In the last column we find 3 months in 3 separate years, August 1936, September 1937, September 1939, 3 comparable months, 3 comparable tonnage figures. How do we explain this reduction from '37 to '39? It is explained by the number of man-hours given the employees of the industry in those 3 years. In August of 1936 the employees in the industry worked 78,208,172 hours to produce 4,184,287 tons. In September of 1937, the employees in the industry worked 79,230,977 man-hours to produce 4,289,507 tons. Here again we come to the impact of the new technology. In September of 1939, the same tonnage was produced that was produced in September of 1937 and yet this tonnage was produced by 62,171,423 man-hours, or a reduction in man-hours in the industry below the 1937 figure of approximately 17,000,000.

Acting Chairman KING. What would be the difference in wages in the aggregate?

Mr. MURRAY. Well, the hourly rates—

Acting Chairman KING (interposing). I mean the entire amount which was paid.

Mr. MURRAY. In "Exhibit No. 2487," Senator, I offer an explanation of that, to show you that despite the fact that our wages have increased approximately 27 to 28 percent since 1936, the tonnage is about the same, monthly pay rolls are here recorded, showing that the pay roll for August 1936—and I again deal with the same 3 months and the same comparable tonnage—the monthly pay rolls show August 1936 \$52,278,846, in August of 1936, distributed amongst 444,953 workers.

In September of 1937, when production had gone about 2 percent above the 1936 figure, the pay roll for that month was \$66,800,712.

In September of 1939, when we had the full impact of our 27- or 28-percent wage increase, the pay roll was approximately the same as the pay roll in August of 1936, \$52,921,352.

Does that answer your question?

Acting Chairman KING. Yes, sir.

Dr. ANDERSON. Mr. Murray, referring to your "Exhibit No. 2488" for just a moment for an explanation, your three bar charts on production are what? Ingot tons? What is the production measure there?

Mr. RUTTENBERG. Open hearth and Bessemer ingots.

Dr. ANDERSON. The second set of figures then on employment of wage earners is wage earners in those particular things, in the open hearth and Bessemer?

Mr. RUTTENBERG. Wage earners in all operations in the industry.

Dr. ANDERSON. Isn't that an incomparable comparison? Aren't you making a comparison here of production, which is total tonnage ingot production?

Mr. RUTTENBERG. If we followed through and had all finished production to compare with the wages it would be the same. The standard accepted measurement of production in the industry is ingot production, and the relation of that to total employees in all parts of the industry and to the total wages paid in all parts of the industry is comparable.

Dr. ANDERSON. In other words, though these are not precisely the same and you are not making a comparison between people employed in that particular production only, you would find no difference if you did make such a comparison.

Mr. RUTTENBERG. The comparison of ingot production in each 3 months is the same as the comparison of all other types of production throughout the industry.

Mr. MURRAY. And as a matter of fact, we are using here the same yardstick to measure these things that the American Iron and Steel Institute and the National Industrial Conference Board and other statistical organizations use to arrive at conclusions.

Acting Chairman KING. Such a relation as you have stated here—

Mr. MURRAY (interposing). It is an established relationship that has been used in terms of results down through the history of the industry and we have merely followed the procedures adopted by the industry itself.

Acting Chairman KING. So they would be based upon a common denominator when you are trying to relate one to the other.

Mr. RUTTENBERG. Yes; the common denominator in the steel industry is open hearth and Bessemer ingot production. It is used throughout the hearings on the steel industry¹ that Mr. Hook referred to yesterday.

Mr. MURRAY. It has been contended before this committee and elsewhere that "substantial reduction in prices could not be effected without great reductions in wage rates."² This contention, no doubt, is based on the fact that from August 1936 to September 1939 (production being comparable in both months), average hourly wage rates in the steel industry rose more than 27 percent, or from 66.8 to 85.1 cents per hour. This increase in hourly wage rates, however, has not resulted in any increase in total wages per ton of ingots produced. The amount of wages per ton of ingots produced in August 1936, and September 1939, was the same, \$12.50 a ton.³ Thus despite a 27-percent increase in average hourly wage rates, total wages per ton of ingots produced, within a 3-year period, were not increased. This was accomplished, of course, by the reduction of 21 percent in the number of man-hours per ton of ingots produced during the same period. Through technological improvements the steel industry has eliminated the effect of increased average hourly wage rates on the labor cost of steel production. In view of these facts, derived from the figures of the industry's own American Iron and Steel Institute, the contention that price reductions can only be made with "great reductions in wage rates" is unsound and unfounded in fact.

EXTENT OF MECHANIZATION COST BORNE BY LABOR

Mr. MURRAY. The only basis for this contention is that if the money required to install the labor-saving machinery that made possible the increase in productive efficiency cannot be charged to the consumer, then labor should pay for the machinery through lower hourly wage rates. Labor in the steel industry, through the Steel Workers' Organizing Committee, will not take wage cuts to pay for machinery that displaces thousands of steel workers. And no responsible person in industry or Government should ask labor to pay for technological improvements out of its pay envelope. Without wage cuts, labor in the steel industry has paid dearly for technological improvements in the last 4 years. Thirty thousand steel workers have helped pay for these improvements with their jobs.⁴ The organized steel workers have the power, and have exercised it, to stop wage cuts, but lacking the cooperation of the industry they are unable by themselves to stop this wholesale displacement of workers. That is why, on behalf of the Nation's steel workers, I am bringing this matter to the attention of this important congressional and governmental committee.

Now, let us look at what has happened to the purchasing power of workers in the steel industry during the last 4 years. In 1936 and 1937 the Steel Workers' Organizing Committee raised average hourly earnings for hourly, piece work, and tonnage workers 26 percent,

¹ See Hearings, Parts 18, 19, 20, 26, 27.

² Verbatim Record of the Proceedings of the Temporary National Economic Comm. Volume XI, No. 6, January 23, 1940, pages 240-241. (Mr. Murray's footnote.)

³ See "Exhibit No. 2486," supra, p. 16486.

⁴ See "Exhibit No. 2488," supra, p. 16488.

or from 66.8 cents per hour in August 1936, to 84.3 cents per hour in September 1937 (both months being comparable in production). During this same period total monthly pay rolls rose in proportion to average hourly earnings—a monthly pay roll rise of a little more than \$14,500,000, or from \$52,200,000 to \$66,800,000.

This was a substantial contribution to national purchasing power of which the Steel Workers Organizing Committee has been justly proud. Having won an increase of \$14,500,000 in total monthly pay rolls, however, the Steel Workers Organizing Committee has been helpless to prevent the steel industry from taking it away through technological improvements. And that is just what has happened. By September 1939, 2 years later, when production returned to the same level of September 1937, total monthly pay rolls failed to likewise return to the level of September 1937. In fact, total monthly pay rolls in September 1939, were virtually what they had been before the 26-percent increase in average hourly earnings, or \$52,900,000. Thus from August 1936, before the increase in hourly earnings, to September 1939, total monthly pay rolls merely increased by 1.2 percent, or to the same extent as production. In other words, despite the increase in hourly earnings, the benefits of technology are not being passed on to steel workers in higher total monthly pay rolls. The new steel technology has not added to national purchasing power through increasing the industry's monthly wage bill; but, on the contrary, has cut down the national purchasing power of consumers to the extent of a 9-percent increase in finished steel prices from 1936 to 1939.¹

At first glance, it would seem impossible to maintain the same monthly pay roll for comparable production after hourly earnings had been raised by more than one-fourth. A close look at the employment situation August 1936, September 1937, and September 1939 (all 3 months being comparable in production), however, shows how increased hourly earnings have failed to raise total pay rolls. Greater productive efficiency, resulting from technological improvements, reduced the number of man-hours worked in the steel industry and the number of steel workers employed. Consequently the higher hourly earnings are being paid to fewer steel workers, with the result that total pay rolls have remained stationary.

The Steel Workers Organizing Committee reduced the maximum workweek in the steel industry in 1937 from 48 to 40 hours. As a consequence, 58,690 more workers were required to produce an equivalent tonnage in September 1937 than in August 1936. This represented a substantial contribution to reducing unemployment. But it did not stick because of technological advances. The number of wage earners in the 2-year period from September 1937 to September 1939 dropped from 503,000 to 415,000—an elimination of more than 88,000 workers—or a decline of 17½ percent in the number of steel workers needed to produce an equivalent tonnage. Compared to August 1936, when maximum hours were 8 per week higher, the number of steel workers in September 1939 was 30,000 less.

(Senator O'Mahoney assumed the chair.)

The CHAIRMAN. Is there any dispute about those figures?

Mr. MURRAY. There may be, I don't know. I suppose there might be. Mr. Hook evidently yesterday said something that would run quite contrary to what I am saying here today.

The CHAIRMAN. What is the source of your figures?

Mr. MURRAY. The source of our figures is the facts, the records of the industry, the American Iron and Steel Institute, the National Industrial Conference Board, and a complete record of the employment figures taken from almost every plant in the United States.

Representative WILLIAMS. As I remember, Mr. Hook said the increase during perhaps a period of 10 years for the entire industry had been 117,000.

Mr. MURRAY. Number of employees.

Mr. PIKE. That was '26 to '37.

Mr. MURRAY. Well, unfortunately Mr. Hook stopped with your committee in the year 1937, when, as I have already stated to this committee, the impact of these technological improvements was beginning to drive right into the heart of the industry and force people onto the streets.

Dr. ANDERSON. Let me read from Mr. Hook's statement and ask your clarification or criticism for the record:

But for the steel industry as a whole we had an actual increase of working forces of 117,000 men from 1927 to 1937. Total employment in the steel industry increased from 427,000 men in 1927 to 544,000 in 1937, according to the figures of the United States Census, an increase of 27 percent, while in the meantime the population increase had been but 11.2 percent.

Now you are discussing here what? Are you discussing the working force available for labor in steel or the actually employed labor force?

Mr. MURRAY. I am discussing the actual number of people employed in the industry in those years.

Dr. ANDERSON. But Mr. Hook was discussing the available labor force employed and unemployed.

Mr. MURRAY. Well, of course, I assume it is taken for granted there are 10 or 11 million people who are available for work in the country who are idle today and can't get jobs.

Mr. PIKE. There is not much difference in the figures. You had 503,000 in 1937 as against 530,000-odd.

Dr. ANDERSON. The other difference to be noted, if the first is not a difference, is that you carry your figures on through 1939. He stops at 1937, as you indicated.

Mr. MURRAY. That is right.

Dr. ANDERSON. If you had stopped at '37 do you presume you would have shown the increase of 27 percent in figures?

Mr. MURRAY. I don't know. I haven't prepared a statistical survey of the situation from '27 through.

Mr. RUTTENBERG. There isn't any basic controversy about the increase in total employment from 1927 to 1937. Mr. Murray did not have an opportunity to hear the information presented yesterday by Mr. Hook and he was not here when that part was presented. It brought us up to 1937. Our information substantially is the same, showing a tremendous rise in employment from '36 to '37. It is since 1937 that the high cost obsolete hand mills have been abandoned in large numbers in the industry. From 1937 through 1939 employment has dropped and the impact of these 27 continuous strip mills is observable

now in the drop, and there is no controversy or conflict in the figures; merely, these figures bring us up to date through 1939, whereas Mr. Hook left off in 1937 when employment was exceptionally high and before the total impact of automatic strip mills had been felt in the industry.

Senator KING. I take it it is your contention that if Mr. Hook had brought it down to date, to 1939 or the beginning of 1940, his figures would have been comparable to yours.

Mr. RUTTENBERG. Yes. These figures are from the American Iron and Steel Institute, sheets 1 and 2, and are supplied to all members of the institute, and they cover more than 90 percent of the industry.

The CHAIRMAN. Sheets 1 and 2, you said?

Mr. RUTTENBERG. Yes; that is in "Exhibit No. 2484" where we submit a complete explanation of the source and method of analysis.

The CHAIRMAN. Sheets 1 and 2 of what?

Mr. RUTTENBERG. The American Iron and Steel Institute.

The CHAIRMAN. Of what document? Name the document.

Mr. RUTTENBERG. It is described in "Exhibit No. 2484." It is known as the American Iron and Steel Institute, New York City, statistical sheets 1 and 2, which are distributed to companies in the steel industry which supply data to the American Iron and Steel Institute.

The CHAIRMAN. Those sheets were issued as of what date?

Mr. RUTTENBERG. They are issued monthly.

The CHAIRMAN. The particular ones you quoted from were issued when?

Mr. RUTTENBERG. Periodically each month.

The CHAIRMAN. So this is a composite figure from sheets 1 and 2 issued monthly over the period included in this survey.

Mr. RUTTENBERG. Yes.

STEEL EMPLOYMENT IN 1929 AND 1939

Representative WILLIAMS. According to your survey now let's have the plain statement, if you can make it, as to whether or not there are more men employed in the steel industry now, say in 1939, than there were in 1927.

Mr. RUTTENBERG. The actual figures we have further on in Mr. Murray's statement; he goes into the year 1929 as compared to 1939, and during that period of time total employment was virtually the same. The American Iron and Steel Institute reports total employment for 1929, the average for the year, as 419,500 employees. They report the average annual employment for 1939 at 423,000 employees. In other words a total employment in '39 was substantially the same as in '29, despite a drop of 36 percent in the average hours worked per week in the respective years.

Representative WILLIAMS. Right in that same connection have you the unit output of the steel industry?

Mr. RUTTENBERG. Yes.

Representative WILLIAMS. What is it, '29 and '39?

Mr. RUTTENBERG. The per-unit output, the figures of the American Iron and Steel Institute in "Exhibit No. 2485" only go back to 1933, and we have that here, showing how many man-hours are worked to produce each ton of ingots. As Mr. Murray observed in his state-

ment, the drop from 1936 to 1939 was 21.4 percent, or from 18.7 to 14.7 man-hours per ton of ingots produced.

Representative WILLIAMS. What I am trying to get at is what the total output was.

Mr. RUTTENBERG. The total actual output in the month?

Representative WILLIAMS. The total actual output of '29 compared with '39.

Mr. RUTTENBERG. The output of 1929 was in excess of 1939.

Representative WILLIAMS. Now, let's have the figures, if you have them.

Mr. RUTTENBERG. I don't have them immediately at hand, but we have comparable production figures for these months that Mr. Murray has explained on these charts.

Representative WILLIAMS. That chart doesn't go back to '29, does it?

Mr. RUTTENBERG. No; it goes to '36.

Representative WILLIAMS. What I am trying to get at in my own mind is the number of men that were employed in '29 compared with '39, and also the output of the industry for the same period of time.

Mr. RUTTENBERG. The output—I have just given the employment for those 2 years; the output for 1929 was greater. I can recall, I think, there were 54,000,000 tons produced in '29; '39 was several million tons below that, less than 50,000,000 tons.

The CHAIRMAN. So that the output has been decreased?

Mr. RUTTENBERG. Yes.

The CHAIRMAN. And the figures on total employment that you gave were practically the same, I understood you to say?

Mr. RUTTENBERG. Yes.

The CHAIRMAN. That is in terms of men, but that figure does not reflect the actual condition because of the change in the number of hours worked per man?

Mr. RUTTENBERG. Precisely.

The CHAIRMAN. Is that right?

Mr. RUTTENBERG. Precisely so.

The CHAIRMAN. Now, could you prepare a statement for a table which will give these figures which Congressman Williams has asked, so they would appear in the record?

Mr. MURRAY. We would be delighted to furnish you with those figures.

Dr. ANDERSON. Mr. Chairman, I have them here, handed to me in Monthly Labor Information Bulletin of the B. L. S. Production in 1929 was 54,300,000 tons ingots; 1939, 45,800,000 tons ingots; employment in the 2 years, 419,000 workers in '29; 415,000 workers in '39. I think that answers the Congressman's question.

The CHAIRMAN. Proceed, then, Mr. Murray.

Mr. MURRAY. Measured in man-hours the drop in employment is more pronounced. From August 1936 to September 1937, man-hours rose 1 percent. But from September 1937 to September 1939 man-hours declined 21½ percent, from 79,000,000 to 62,000,000 man-hours—a drop of 17,000,000 man-hours in the short space of 2 years.

Briefly summarized, the period from August 1936 to September 1939 shows that the steel industry, through the installation of technological improvements had done the following:

1. Maintained the same labor cost of production despite an increase of more than one-fourth in hourly wage rates.

2. Eliminated \$14,000,000 from the total monthly pay envelopes of the steel workers from 1937 to 1939.

The CHAIRMAN. I will have to interrupt you because I am now examining the chart from the B. L. S. to which Dr. Anderson called attention. This shows, with 1929 as a basis, a production of 54,300,000 tons ingots, which is designated 100 percent. A total employment of 419,000 workers designated 100 percent, and weekly pay rolls amounting to \$14,060,000, which is also designated as 100 percent. So the figures for 1929 represent a 100-percent base of production, employment, and pay roll. In 1937 the production was 91 percent of 1929, but employment was 120 percent, a very great increase; and weekly pay rolls amounted to 112 percent, an increase of 12 percent. In 1938 production had fallen off to 51 percent of 1929, employment to 88 percent of 1929, and pay rolls to 83 percent of 1929. Now as to 1939, production amounted to 45,800,000 tons ingots, which was 84 percent of 1929. The workers numbered 415,000, or 99 percent, and the pay roll \$12,410,000, or 88 percent, so we have this conclusion, that in 1939 in the steel industry, though the production had fallen off by 16 percent, the employment had fallen off only 1 percent and wages had fallen off 12 percent.

Mr. MURRAY. That is a very good analysis and in substance supports the contention of the organization, my own organization, with relation to—

The CHAIRMAN (interposing). But it indicates, you see, that it required more persons proportionately to produce the output in 1939 than it did in 1929.

Mr. RUTTENBERG. I think there is a footnote, Senator, that explains that chart, at the bottom of the chart in connection with the comparison of your drawing.

The CHAIRMAN (reading):

These data presented for all manufacturing industries combined and for a few selected industries are not suitable for use in measuring changes in labor productivity in these industries.

Well, of course, that is one of the difficulties I am constantly finding about statistics. The experts come in here with statistics and after you have read them, then there is a footnote in small type which says, "Pay no attention to them."

Mr. STERN. Would you mind reading the next sentence? It explains why.

The CHAIRMAN (reading):

Labor productivity is generally measured in terms of output per man per hour. The figures of employment given here cannot be used as an indication of actual man hours worked because they include total as well as part-time employment and the ratio between the two varies greatly from industry to industry, and from month to month in the same industry. Pay rolls are a better criterion of man hours worked, but they are greatly affected by changes in the hourly earnings. Until more precise information is available on actual man hours worked in the separate industries and a better method is devised to measure changes in industrial output, studies of changes in labor productivity from such data as are presented here are bound to be inconclusive and at times even misleading.

Dr. ANDERSON. Mr. Chairman, to protect my profession, I would like to comment that I didn't read the last section of that chart in presenting the data to you for the very reason that you have now discovered, and furthermore—

The CHAIRMAN (interposing). You have been holding out on me?

Dr. ANDERSON. I was holding out for that very reason, because it is very plain we do not have the adequate body of data to do the thing attempted in the last part.

The CHAIRMAN. Of course, one of the purposes of this hearing is, if possible, to develop statistics upon which all can agree.

Dr. ANDERSON. And I am only sorry that Mr. Hinrichs and Mr. Lubin are not here because they are responsible for this document, and I know they would be the first to tell you that one of the great needs in the United States is an adequate body of data, of factual material upon which we can actually build national policies; and that depends upon many developments, including an adequate budget for the Bureau of Labor Statistics.

The CHAIRMAN. I have heard that story on the Appropriations Committee many times and the next time I hear it I am going to have some of these charts with me and find out why we can't get accurate information.

Mr. MURRAY. You see, Mr. Chairman, the best answer—and it doesn't require the effort of any statistical expert to get the answer—is to be found in the men that are walking the streets.

The CHAIRMAN. I think you are quite right about that.

Mr. MURRAY. That is the answer.

The CHAIRMAN. No matter what increase of production we show.

Mr. MURRAY. I just don't care how much industrialists or any others care to indulge in the magic of figures about these things. I am living among steel workers. I visit their homes. I talk to them. I meet with them. I really live with them. I know the conditions. Mike Russell appeared before the committee today as just one of 5,000 idle people in one community in the city of New Castle. I could take this committee to Martins Ferry, Ohio, to Mingo Junction, Ohio, to Elwood, Ind., to Monessen in Pennsylvania, to Brad-dock, to Duquesne, to Homestead, and there are the figures, but they are the figures of human beings walking the streets out of jobs.

Now there just simply isn't any statistical set-up that can deny that sort of a situation. It is there.

The CHAIRMAN. Well, there were statistical set-ups in some of the columns just a few weeks ago which undertook to prove that there were only about 2,000,000 persons unemployed now, in the entire country.

Mr. MURRAY. Of course, Dorothy [Thompson] doesn't work in a steel mill. Now with your permission, Mr. Chairman, I would like to continue here.

INCREASE IN PRODUCTION FROM 1929 TO 1939

Mr. PIKE. Mr. Murray, I think that question of Congressman Williams was well answered in your chart, "Exhibit No. 2483," which you really didn't call much attention to.

It happened at the end of 1929 and end of 1939 the pay rolls are almost exactly the same per ton, but they certainly wandered all over the place in the 10 years intervening. The man-hours you show most graphically in the last 2 or 3 years.

Mr. RUTTENBERG. This measurement by the National Industrial Conference Board was made in conjunction with the American Iron

and Steel Institute and it shows a progressive decline in man-hours per ton of output for 1929 on down through 1939, or a drop from approximately 82 in 1929 down to 64 in 1939, and this is the statistical chart that shows the story that Mr. Murray has been telling in human terms, existing in these various towns he has mentioned. It is the only one on a national basis that exists anywhere, so far as we are able to determine.

The CHAIRMAN. Now, according to this chart, the average was the condition that existed in 1932; that is your base.

Mr. RUTTENBERG. Right.

The CHAIRMAN. That is 100 percent, and it shows that in 1932 the peak of man-hours was reached at 110; that it has fallen off precipitously since then until in 1934 it was below 85.

Mr. PIKE. Below 65.

The CHAIRMAN. In 1934 it was below 85. In 1935 it was about 82; in 1936 it was just below 80; in 1937 it was at 75; showed a slight increase in 1936; and in 1939 had dropped to below 65. In other words, in 1939 in terms of man-hours the record was less than 65 percent of what it had been in 1932 and that, I take it, can be regarded as a more accurate representation of the facts than the actual number of persons employed.

Mr. RUTTENBERG. Precisely.

The CHAIRMAN. Because the persons employed may not be working as many hours as they were in previous years. Is that your point of view?

Mr. MURRAY. That is right.

The CHAIRMAN. And this chart from which I have been reading was prepared by the National Industrial Conference Board on the statistics gathered by the American Steel Institute; is that correct?

Mr. RUTTENBERG. On statistics gathered jointly by the Conference Board and the American Iron and Steel Institute.

The CHAIRMAN. Now neither of these institutions is a C. I. O. affiliate?

Mr. RUTTENBERG. Not so far as we are aware.

Mr. STERN. For the sake of the record, the chart refers to man-hours per ton, not to the man-hours worked. It is the time the labor time consumed to produce a ton of product. It isn't total man-hours worked.

The CHAIRMAN. That doesn't tell the story of employment, either, then. That doesn't tell our employment story at all.

Mr. RUTTENBERG. This tells the employment story precisely, I think. It shows the man-hours per ton. When you referred to man-hours per ton going away up in 1932 that was a reflection of a low operation, and as operations become on a comparable basis in '39 you have your precise number of hours of men you had to work to produce a given ton of output, and that measures progressively the fewer hours of work required to produce the same output.

The CHAIRMAN. That is right, but when you get to that statistical and expert formula you are getting away from the human problem in which I am particularly interested and trying to develop the fact. I am sorry, Mr. Murray; if you will proceed.

Mr. MURRAY. I am glad that you clarify those things.

3. Raised productive efficiency by one-fifth.

4. Displaced 30,000 steel workers.

5. Increased finished steel prices 9 percent. In other words, the steel industry is able to produce the same amount of steel with 30,000 fewer workers. The steel workers who are currently employed are receiving more than 26 percent higher wages per hour, but at the expense of 30,000 steel workers who have been displaced and are receiving no wages from the steel industry. And the steel workers still attached to the industry are idle one-fifth to two-fifths of the year, because the increased productive efficiency enables them to produce all the steel consumed each year in three-fifths to four-fifths of the year.

Now with your permission again, Mr. Chairman, I would like to dispense with reading the next 4 pages, and have them placed in the record.

The CHAIRMAN. All right, it will be included in its regular order in your printed statement.

(The material referred to appears below:)

Needless to add, if the Steel Workers Organizing Committee had not raised wage rates and lowered weekly hours during this 4-year period, 1936 through 1939, the situation would be much worse than it is today. As I have previously noted, the automatic strip mills were introduced into the steel industry before the birth of the S. W. O. C. The increase in output per man-hour, the reductions in pay rolls and employment, and the displacement of workers was virtually an accomplished fact before the steel workers were successful in organizing their union. Therefore, if the steel workers had not organized, as they did, in 1936 and 1937, wage rates would not have been increased to the extent that they were, nor would the maximum hours per week have been correspondingly reduced. Consequently, the net contribution, after 3 years, of the S. W. O. C. has been to prevent—

1. The reduction of the total monthly pay rolls of the steel industry by more than $\frac{1}{4}$ the amount of the increase in hourly earnings.

2. The permanent elimination of 58,000 steel workers from their jobs, or the difference in the number of workers required to produce an equivalent tonnage on a 40-hour week as compared to a 48-hour week.

In other words, the S. W. O. C. has been the only cushion to the devastating effects of the new steel technology. S. W. O. C. raised monthly pay rolls by more than \$14,500,000 a month for a period of a couple years. Technology eliminated almost all of this increase. But S. W. O. C. stopped technology from reducing total monthly pay rolls by one-fourth. S. W. O. C. saved the jobs of over 50,000 steel workers. If S. W. O. C.'s contribution had not been made, there would be today 88,000 displaced steel workers instead of 30,000, and instead of the steel industry's contribution to consumers' purchasing power remaining virtually the same, it would have been lowered by more than 25 percent.

The 10-year employment record of the steel industry, from 1929 through 1939, shows the extent to which technology has eliminated workers. The American Iron & Steel Institute reports an average of 419,500 wage earners in 1929, as compared to 425,000 10 years later in 1939.¹ As I have noted, in 1937 considerably more workers were employed as a result of the shorter workweek instituted then, but they mostly have been eliminated by technology. Thus in 1939 the number of wage earners was only 5,500 more than in 1929, or a rise of $1\frac{1}{10}$ percent in 10 years. But during this 10-year period average weekly hours declined from 55 to 35 a week, or 36 percent. Thus, instead of more men being employed to get out the same tonnage in the shorter week, the number of wage earners has remained virtually stationary. In presenting information to this committee the United States Steel Corporation, for its own operations, computed the number of wage earners that would be required during the thirties on the basis of prevailing weekly hours in the year 1929.²

¹ *Steel Facts*, February 1940, American Iron and Steel Institute, pages 2, 3, and 4 (Mr. Murray's footnote).

² TNEC "Exhibit 1409," Actual Number of Employees And Number That Would Have Been Required on Basis of 1929 Hours Per Week, United States Steel Corporation and Subsidiaries (Mr. Murray's footnote).

The corporation did this by multiplying the actual number of employees in each year or month by the number of hours worked per week during the period and dividing by the number of hours worked per week during the year 1929.

By this method we find that on the basis of weekly hours in the year 1929, steel industry in 1939, the year just past, would have employed only 270,000 wage earners. This represents the elimination of 150,000 wage earners, or a decline in employment of 35 percent. In other words, if reductions in the maximum hours of work per week had not been effectuated from 1929 to 1939, 150,000 steel workers conceivably would have been displaced in the past 10 years. In addition, nothing has been done to expand steel employment, which is today at virtually the same levels as 1929. It is plainly observable, therefore, that technology has been at the root of unemployment since 1929, and since that time the steel industry has failed to give employment to young workers becoming of employable age without displacing older workers. On a net basis, the steel industry, the wealthiest in the country, has failed to absorb in its working force any of the increase in employable workers resulting from our rising population in the last decade. As a matter of fact, as I noted earlier in my statement, more than 40,000 steel workers now attached to the steel industry are scheduled to be displaced by the automatic strip mills. You will recall I showed by actual figures that 38,470 of the 84,770 workers scheduled to be eliminated by the strip mills have already been laid off permanently in the past 10 years. Therefore, the steel industry has failed in both respects; it has not absorbed any new workers, and secondly, it will soon be employing fewer workers than in 1929.

Dr. ANDERSON. There were no exhibits?

Mr. MURRAY. None that I know of in that whole thing.

INTERINDUSTRY COMPETITION

Mr. MURRAY. The new steel technology is not creating new jobs elsewhere to compensate for the jobs directly eliminated in the steel industry. The automatic strip mill, for example, instead of adding to total employment by creating new industries or expanding old industries to offset its devastating effects in the steel industry, is robbing jobs from old-established industries. The new jobs created through the development of new industries utilizing the automatic strip mill output, or through the expansion of old industries using the automatic strip mill output, are virtually canceled out. A major strip mill product, for instance, is tin plate. A new use developed for tin plate in recent years has been to pack beer in tin cans. But beer cans, in turn, mean fewer glass bottles and other containers, and correspondingly less employment in these lines.

Sheet steel is another major strip-mill product, and a new outlet is being developed for sheet steel in the plumbing-fixture industry. But this inevitably means the displacement of workers now employed in foundries producing cast iron enameled plumbing fixtures. Another outlet for sheet steel, still in a very early stage, is prefabricated steel housing.

The CHAIRMAN. But yesterday Mr. Hook presented a chart which showed various commodities which he said are now being manufactured which were not manufactured previously, with the product of the old hand rolling mill. That may not have been true of each one of the items which he mentioned, but among those industries which have come into existence and which are using tin plate, for example, was the electric refrigerator. Now the electric refrigerator obviously can be used in places where the old-style refrigerator, filled every morning by the iceman on his rounds, could not be used;

electric refrigerators are used in farms and ranch homes where it would have been impossible to get ice, where the cooling device was to stack things in a cellar. The development of the Delco system and of rural electrification has made possible the use of electric refrigerators where they never were before, and where they are not displacing any other commodity but are adding a new convenience to the home and for the benefit of the housewife.

I think that we must acknowledge that there are new commodities coming into existence, don't you think, which do not displace?

MR. MURRAY. Of course, that is undeniably so. However, I am not prepared to say that I am in perfect accord with the idea that the mere introduction of an electric ice box has given more men jobs because ice boxes were substantially used in the larger centers of population in years gone by and did comprehend the employment of workers, particularly lumber workers, and the icemen that we hear talked about quite frequently are not in the picture any more. Of course in the rural districts where rural electrification has enhanced work opportunities and has perhaps put an occasional ice box in a farmer's home that was able to buy one, it has added something to the comfort of that particular farmer and perhaps given another fellow a job.

THE CHAIRMAN. I may say the impression that has been made upon me in my study has been that undoubtedly advancing technology creates many new jobs. At the same time it undoubtedly displaces many workers, and the problem is the human problem, the absorption of the particular person who is displaced.

Now you brought your human exhibit here this morning in the person of Mike Russell. He was displaced. Some new job may have been created in some other and distant town, but it isn't a job for him. He must then depend upon the contribution of the Federal Government through W. P. A. appropriations to provide a most meager income for his family, and it is how we are to take care of the particular person who is displaced that to my mind is the most pressing question in this whole problem. Do you agree with that statement?

PROBLEM OF NEW ENTRANTS TO LABOR FORCE

MR. MURRAY. Oh, in substance I do. I think that it is all right, Senator; yes. Of course, it isn't merely a question of absorbing people who are actually displaced by new technological changes. That isn't the sole factor that disturbs this Nation or upsets our economy. It is the very definite inability of American enterprise and American industry to give employment to the newer generation that is coming along. When I talk of 30,000 steel workers being definitely thrown out in the streets during the past 3 years I am merely talking about people who had jobs in this industry in 1936, but necessity compels me to think about these younger people who have been pouring out of our schools and growing up and who are physically fit, wondering what the great captains of industry are going to do about them.

I know the steel industry isn't going to do anything about them, unless there comes into their hearts and their souls and their minds the consciousness that there are some definite social responsibilities that run beyond the payment of ordinary dividends to stockholders.

The CHAIRMAN. Well, could the steel industry, or any industry by itself, meet this problem?

Mr. MURRAY. No; I don't say so. I think that in all fairness to any industry; I don't say it is a one-industry problem.

The CHAIRMAN. It is a national problem?

Mr. MURRAY. It is a national problem. I merely use the industry as one of many industries where ownership, management, have not indicated to me, and so far as I am aware, have not indicated to government any desire to do anything about it, excepting that the new technology produces new enterprises and perhaps in the days to come will give work to the coming generations, but that kind of an attitude has not been fruitful of any results during the past 11 years. Eleven years ago we heard that, 10 years ago, 9 years ago, 8 years ago, and today one of America's most distinguished leaders in the field of business, representing a great body of organized wealth and business in this country, appears before this committee and says there is nothing to be worried about, that the newer technology creates new enterprise.

My God! Ten years ago we were told that—11 years ago. I believe in the introduction of new enterprise—I hope some day it will come. Mr. Hook perhaps could lecture this committee about high taxes, free enterprise. I am here not to lecture but rather to persuade and plead with and talk to this Nation through the medium of this committee about our Government and our industries in this country and labor getting their heads together and doing something to save this Nation of ours; to save these institutions of ours in this country; to save this form of government by providing this much-needed employment to these idle people. It has just simply gone beyond the stage of guessing any more about it. I would like, Senator, and this isn't said disparagingly about you, either, because I have a great fondness for you and you have been doing a great work over here, given great study to it; I haven't been able to find any industrialist in this country that is willing to offer any solution, and I can't find the politicians that will do it because the proposition doesn't seem to have, in the language of the streets, any political sex appeal; it doesn't seem to be a very good vote getter; at least that is what they think. And as one layman—and I am a very ordinary layman, humble in spirit, who wants to do the right thing—I think our Federal Congress should lead the way.

I think the President of the United States should be asked, in the form of a congressional resolution, to draft into public service some of the important men in this country and tell them to get to work for 6 months, a year, yes—however long it may be—to settle this problem of unemployment in this country, because I get over my desk—I represent half a million steel workers—every morning pleas, prayers, from a lot of people in this country, and there isn't a single solitary thing that I can do to help them; I can't do anything. I represent a great big union. Well, I am utterly helpless because there is evidence of a lack of desire on the part of government, on the part of business, to be cooperative in providing the proper kind of solution for this situation.

The CHAIRMAN. I am glad you have made that statement, Mr. Murray. I feel, from my own experience, that much of what you have said is true, but I can tell you this: since the study of this

committee began, and that is considerably over a year ago, I have had occasion to talk with many business groups as well as with leaders of all other groups, and I have come to the very definite conclusion, and I take the liberty of conveying it to you, that a great majority of all the people in this country in every classification, whether they are industrial leaders or workers or farmers, want to see this problem settled and they are willing to settle it, and most of these, by far the most of them, express exactly the same thought that you have expressed here, namely, that they want to save our form of government, our democratic institutions. I am sorry to say that there are a small percentage of persons on the two extremes who spend so much time calling one another names that the 95 percent of the people in between don't have very much opportunity to get their thought over.

One of the hopes of this committee has been that it might prove the microphone, as it were, through which there could be conveyed to the country a sensibility of the necessity for cooperative and immediate action to put people to work in private industry so that the Government would not be under the necessity of continuing to expand and to grow and to apparently control things. I think we have both been a little bit off the direct subject.

Mr. MURRAY. We are both getting a little bit sentimental. Now, with your permission, Mr. Chairman, and, of course, again reminding you of my request to include in the record, I should like to cooperate with the committee and expedite the reading of this paper and not read "Jobs Not Created Elsewhere," and continue over to p. 41 from 33.

(The material referred to appears below:)

It is estimated that a prefabricated steel house can be produced and erected with one-fourth of the labor required to build a house by conventional methods. But any such development on a large scale would cost the jobs not only of a great body of building-trades workers, but also of brick and clay, lumber, cement, and other workers now employed to produce building materials.

The facts about our national economy attest that this vicious circle of technological unemployment, as illustrated by the strip mill, is typical of technological developments in industry generally during the past decade. In the last year of the thirties production reached the levels of 1929 and exceeded them, but total employment was below that of 1929 by 1,000,000 to 2,500,000 workers. In discussing this question the Federal Reserve Board states:¹

"The larger total volume of output currently (January 1940) than in 1929 reflects continued technical progress during the decade; the number of persons employed, excluding those working on relief projects, is slightly smaller than 10 years ago and those with jobs are working much shorter hours."

Also in this period, the Board noted, population has increased about 8 percent.

The impact of technology on our economy during the 1930's has been one of the major factors retarding a sound recovery and sustained prosperity. The problem of this technology is twofold.

First, ways and means must be found to provide for the men and women, their families, and their communities, who are the victims of technological change. Industry must assume social responsibility for the human beings who are discarded by new industrial techniques that industry owns, controls, and installs.

Secondly, ways and means must be found to distribute the benefits of technology to everyone in the country, to arrest the trend toward a declining working force, and to provide employment—the means of life, liberty, and the pursuit of happiness—to the large mass of men and women, one-third of whom are young men and women, who are today idle through no fault of their own, who are idle because of the failure of private industry to provide them with jobs.

¹ Federal Reserve Bulletin, February 1940, p. 81.

PROVIDING FOR DISPLACED WORKERS

Let us consider the first of these problems, the men and women who are disemployed by technology.

The cost of technology has always been enormous socially. With every technical improvement since the beginning of the Industrial Revolution has come the displacement of labor, the upheaval of human beings, the dislocation of towns and entire regions. The history of technology in industry is a story of continual change in productive techniques and processes and the continual disregard of the human suffering caused by these changes. This disregard for the victims of technology has to be changed to solicitation for their welfare.

A half-century ago puddlers produced the bulk of iron in the United States. Today iron puddling is almost a vanished art. Huge blast furnaces, costing from \$4,000,000 to \$6,000,000 each, produce the bulk of iron at present. Technology has played a major role here. The number of blast furnaces¹ since the World War has declined 49 percent, while the average annual capacity of each furnace has increased 131 percent. The National Industrial Conference Board¹ reports:

"The installation of labor-saving devices, such as contrivances for mechanical charging of raw material—ore, coke, and limestone—and machine casting of molten pig iron has increased the efficiency of blast furnaces. The effect of these changes and the increased size of the blast furnace units have had comparatively little effect on the size of the labor force attending individual furnaces because a substantial increase in the daily output per furnace has not required a proportionate increase in the amount of labor."

Just as radically, open-hearth steel production has supplanted the bessemer steel process, which produced a majority of the steel at the turn of the century, but now accounts for less than 10 percent of the current steel output. In their wake the seamless-tube mills likewise have left many lap-weld and butt-weld tube mills obsolete and abandoned.

The social costs of each of these major technological changes in the steel industry in the past half century have been incalculable in terms of human suffering and misery. The detailed story of each one is merely a repetition of the story of the automatic strip mill. My purpose in citing the history of steel technology during this period is to show that it is a continuous process, as regular as the flow of the Ohio River. It is always taking place. At this very moment several steel companies are installing continuous butt-weld pipe mills, whose impact on employment and wages is to reduce them further.

A brief look at the continuous butt-weld mills gives an indication of how severe the new steel technology is on employment and pay rolls. The 8-hour crew on a hand butt-weld mill consists of 34 workers. On the continuous butt-weld mill an 8-hour crew consists of only 9 workers. The output per 8-hour period on the continuous mill is increased from 12 percent, for ½-inch pipe, to 60 percent, for 3-inch pipe, or from 65 tons of ½-inch pipe to 73 tons, and from 84 tons of 3-inch pipe to 135 tons.

The labor cost per ton of ½-inch pipe is reduced 78 percent, or from \$3.85 a ton on the hand mill to \$0.86 per ton on the continuous mill. For 3-inch pipe the reduction is 84 percent, or from \$2.98 a ton to \$0.47 a ton. These figures are from the records of one of the companies operating a continuous butt-weld pipe mill. I am submitting "Exhibit No. 2489," a comparison of the hand-mill and continuous-mill crews, showing the wages of each member of the crew per hour and per day, and the 8-hour wage bill for the entire crew on each type of mill. The labor cost per ton of pipe was computed on the basis of the production figures I have just cited, which were given to me by company officials as typical 8-hour performances.

A continuous butt-weld pipe mill displaces exactly 100 workers. A full force consists of 4 crews, or 136 workers on a hand mill. For the continuous mill the full force consists of 36 workers, or a reduction of 75 percent. Continuous butt-weld pipe mills are a recent innovation. Republic Steel Corporation just put 1 of these mills in operation last fall in Youngstown and is building another 1. Bethlehem Steel Co. started operations on 1 in Sparrows Point a few months ago, and is constructing another one. Another was announced to be built in Indiana Harbor last July, and Wheeling Steel Corporation announced construction of a

¹ *Iron and Steel*, July 1939, National Industrial Conference Board, p. 7. (Mr. Murray's footnote.)

continuous pipe mill for Benwood last November. The National Supply Co. is building another continuous mill, having put 1 in operation a few years ago. In other words, a total of 8 continuous butt-weld pipe mills have been installed in the last couple years or will have been installed by the end of this year.

The combined net displacement of these 8 mills amounts to 800 pipe mill workers. Like the sheet and tin plate workers displaced on the hand-type mills by the automatic strip mills, these pipe mill men, in the main, are skilled workers. They have spent years acquiring their skills, which are no longer needed, and many of them are beyond the most favored age for hiring in the steel industry.

This continuous displacement of workers by technology is an old story. It is going on in the steel industry right this moment, and it will continue to take place as long as leaders of industry are permitted to evade responsibility for the social consequences of the technology which they control.

I want to publicly inform the steel companies that are this minute installing continuous butt-weld pipe mills that the Steel Workers Organizing Committee will not stand for one single steel worker being thrown out in the street, without adequate compensation, as a result of the installation of these automatic pipe mills. I invite these companies to sit down at the conference table with the S. W. O. C. and work out, through the normal processes of collective bargaining, ways and means for taking care of the workers being displaced by the continuous pipe mills. This invitation is also being publicly extended to all steel companies in connection with the installation of technological improvements in the future.

I know of nothing more contemptible in public life than for industrial leaders to issue pronouncements that the workers they are throwing on the streets—workers they are displacing with new machinery—will some day be reabsorbed by private industry somewhere. This callous attitude toward human suffering is the cause of social upheavals, of the destruction of democracy that may trail in the wake of technology unless the people vested with the control of technology are made to assume adequate social responsibility for its consequences.

Classical economic pronouncements about the automatic reabsorption of displaced workers by private industry, whether true in the long run or not, are just so much dribble to the men and women who are deprived of their accustomed way of making a livelihood. These pronouncements can be classified with the myths of the 1920's that no intelligent person can have faith in today, in view of the striking failure of our economy in the last 10 years to reabsorb the victims of technology. Something more than pronouncements of economic theory—in this instance, demonstrated fallacious—is needed.

I join with Mr. Edward R. Stettinius, chairman of the board of the United States Steel Corporation,¹ in the idea he expressed in his lecture, *Human Factors in Economic Progress*:

"When a whole community can stumble into despair with the stoppage of a single pay roll, it is self-evident that industry has far-reaching social implications which should be matched by an equal sense of social responsibility. It is no exaggeration to say that one of the most important functions of business administration, on the large scale, is the social function. Having helped to create the modern society, the businessman will not be excused from the duty of coping with its problems."

One of these problems of modern society is the displacement of workers by technology. I invite the leaders of industry to cope with it, to put the idea expressed by Mr. Stettinius about industry's social responsibilities into practice.

I will not be sidetracked in my efforts to prevent technology from casting workers out of our economic machinery, by engaging in any debate on whether these workers will or will not find other jobs 5, 10, or 20 years hence. As a famous economist once said, in the long run we are all dead. The problem of the victims of technology is an immediate one. I say to the leaders of industry keep your economic theories in textbooks. So far as the workers of this great Nation are concerned, they want to know only one thing—when do they get jobs? When are they going to be protected from losing their jobs every time a new contraption or a new invention is discovered? When are their children, the youth of this Nation, who are roaming the streets today, going to get jobs? This is the question. This is the big problem of today. And I agree heartily with Mr. Stettinius when he says, "Having helped to create the modern society, the businessman will not be excused from the duty of coping with its problems."

¹"Human Factors in Economic Progress," by Edward R. Stettinius, Jr., Alexander Hamilton Institute, New York, pp. 5-6. (Mr. Murray's footnote.)

Here is the twofold problem of technological displacement and unemployment. Businessmen, leaders of industry, have to cope with it. The code of social responsibility for industry must be enlarged. Two decades ago industry assumed social responsibility through workmen's compensation for the workers injured in mines, mills, and factories, and for the families of workers killed on the job. In the past decade industry has assumed some measure of social responsibility for workers who are too old to work, and for workers who are seasonally unemployed through old-age pensions and unemployment compensation. In this decade another social responsibility must be assumed by industry. This responsibility is to workers who are technologically unemployed, thrown out of work by new machinery.

By what right does industry assume the prerogative to say: "Here is a new machine. It will bring benefits to society. Therefore, it is installed." By what right does industry displace workers, ruin communities, reduce consumers' purchasing power with technology before that technology can possibly bring any benefits to society as a whole? Only by the right made by power does industry bring about such social liabilities before bringing about any social gains. Why should workers and their families be thrown to the wolves today, just because industry says it has found a new machine that will benefit society tomorrow? What if it fails to benefit society? What if it does benefit society tomorrow? Today there are human beings that must be provided for. This is the crucial problem of technology. Technological unemployment is unnecessary. It must be eliminated.

No longer can we afford, as a Nation, to set our eyes on that future when specific technological improvements will bring social improvements, while at the same time we fail to see the human misery wrought in our midst by these very technological improvements. The social cost of technology, as clearly demonstrated by the automatic strip mill in the steel industry, is greater than we can bear. Unless the social cost of technology is eliminated, it will drag us into economic, social, and political ruin.

The social cost of technology must be eliminated. No longer can we afford to wait for the economic benefits of technology to offset the tremendous social cost at its inception, because the social cost of technology for more than a decade has been far greater than technology's economic benefits. This social cost must be eliminated, or else technology will cease to be a boon to mankind. Industry must assume social responsibility for technological improvements, by seeing that they are introduced under conditions that stimulate instead of retard employment, to see that workers are not displaced, to see that towns are not reduced to ruin, to see that there is no immediate social cost in terms of displaced workers, impoverished families, devastated communities, and bankrupt regions.

Dr. ANDERSON. There is an exhibit on page 36 to be included.

Mr. MURRAY. Yes; if you please.

The CHAIRMAN. That will be received.

(The table referred to is marked "Exhibit No. 2489" and is included in the appendix on p. 17345.)

Mr. MURRAY. I will conclude with the introduction of my recommendations.

The CHAIRMAN. Very well.

Mr. MURRAY. I want to discuss, briefly, practical ways in which industry can assume social responsibility for technological improvements. In many instances this can be done through the normal processes of collective bargaining. Technological improvements should be introduced without workers having to pay for them through the loss of their jobs. This can be done through collective bargaining, in many instances, along the following lines:

1. The workers to be displaced by technical improvements should be reabsorbed in the regular labor turn-over of the companies installing them.

2. The workers to be displaced should be notified at least 6 months in advance. From then until they are finally displaced, they should

be given opportunities to learn how to do other jobs where openings develop periodically. Where necessary, expert vocational guidance and training should be provided for those workers who cannot easily adjust themselves to other jobs.

3. Those workers for whom there are no openings when they are finally displaced should be employed in some capacity until regular jobs open up for them. The wages paid those workers until they are placed on regular jobs should be charged to the original cost of the technological improvement.

4. Displaced workers who suffer a reduction of 10 or more percent in their average daily earnings as a result of being absorbed on lower-paying jobs than their original ones should be paid a job compensation of 3 percent of their earnings while in the service of the company.

Mr. PIKE. That would be total earnings.

Mr. MURRAY. Up to the time they were demoted or given a job where a lower rate is being paid.

The job compensation payments should be charged to the cost of the technological improvement.

5. The displaced workers who, for various reasons, cannot be reabsorbed in other jobs should be paid a dismissal wage of 10 percent of their earnings for a 10-year period, but not less than \$500 to those workers with less than 10 years of service. The dismissal wages shall be charged to the cost of the technological improvement.

This plan will help eliminate the social cost of the technological improvements. Jobs will be found for most of the displaced workers, and those who are not reabsorbed will be compensated, in part, for the loss of their jobs; while those who suffer reductions in their earnings by being reabsorbed on a lower-paying job will, in part, be compensated for this.

This practical plan is not offered as the final solution for all the problems incident to the installation of technological improvements. Instead, I am offering these concrete suggestions for practical consideration by the parties to collective-bargaining agreements in industry; the objective being to eliminate the heavy social cost of technology.

There is no reason why this plan cannot be adopted by management generally where collective bargaining is practiced. Collective bargaining in the basic industries, however, is practiced on a company-wide basis, and therefore cannot cope with large technological improvements, like the automatic strip mill, that are industry-wide and national in character. Consequently, in the absence of universal collective bargaining, congressional regulation of the introduction of large technological changes is necessary. It is not my purpose to outline in final detail such regulations. At this time I want merely to indicate broad general outlines.

The objective of these regulations should be to eliminate the social cost of technology. This means that technological improvements should be installed at such times and under such conditions as not to displace workers, bankrupt communities, close up complete mills, and otherwise disrupt the social fabric of industrial districts.

Mr. MURRAY. These regulations might take the following form:

1. It should be compulsory for industry to pay adequate dismissal wages to all workers who are displaced as the result of technological changes.

2. The Federal Government should conduct a large-scale vocational-training program for displaced workers who are paid dismissal wages, so that they will be better adapted for other jobs in industry that they might be able to secure, when their dismissal wages are exhausted. It is essential that labor should participate in the administration of such a vocational-training program.

3. In addition to compulsory dismissal wages, other measures designed to have industry immediately reabsorb workers displaced by technological changes should be adopted.

In connection with the proposal that congressional measures might be enacted to provide industry with incentives to keep workers affected by technological changes on the pay roll until they can be reabsorbed in the normal labor turn-over, I want to make a few general observations. At the present time, for instance, when a technological improvement is installed that displaces, say, 100 workers, they are thrown on the streets. State relief has to be provided for them. They draw unemployment compensation benefits for a period of time. W. P. A. jobs have to be found for them. N. Y. A. and C. C. C. assistance has to be provided for their children. All this assistance industry has to pay for in the form of taxes. Here is an opportunity for industry to do something about reducing its tax bill, about which it has been complaining. Instead of throwing these displaced workers on the streets every time a technological change is made, industry should plan technological changes in such a way that the workers immediately affected are kept on the pay roll and eventually placed in regular positions in the normal labor turn-over. Thus the money that would otherwise have been paid to these displaced workers in relief grants, work-relief wages, and so forth, would be saved, and industry's overall tax bill would be accordingly reduced.

It should therefore be the policy of the Federal Government to see that technological improvements are carefully planned and properly introduced by industry so that they do not displace regularly employed workers. In this way the men and women, their families, and communities who have been the victims of technological changes in the past, would be provided for, and industry would assume social responsibility for the workers, their families, and communities who otherwise would be discarded by new production methods and processes.

These proposals are designed to prevent regularly employed workers from being added to the ranks of the unemployed, and thus only deal with part of the problem of technological unemployment. The other part of this problem—the major part of the problem of technological unemployment—is to find ways and means to distribute the benefits of technology to everyone in the country, to arrest the trend toward a declining working force, and to provide employment for the large mass of men and women who are today idle through no fault of their own, who are idle because of the failure of industry to provide them with jobs.

By making provisions to absorb displaced workers in the normal labor turn-over, idle workers and young workers becoming of employable age, who would be absorbed in the normal labor turn-over if there were no displaced workers, remain unemployed. It is necessary, therefore, that proposals be adopted dealing with the major problem, which is that of finding jobs for workers who are presently unemployed and are not being absorbed by private industry because of the rapid strides of technological improvements. In connection with this larger problem, congressional measures might be enacted which are designed to—

1. Pass on to consumers generally the economic benefits of technological improvements which are not being passed on in large enough amounts at the present time, or are being passed on too late to prevent our economic machinery from becoming jammed.

2. The maximum workweek in basic mass-producing industries which are highly developed from a technological point of view should be reduced. The performance of the steel industry in the past 10 years, as I have shown, illustrates the vital necessity for a further reduction in the maximum workweek. At the same time the population of the country as a whole has increased approximately 8 percent. Thus, despite a decrease of more than one-third in the average workweek, the steel industry, the wealthiest in the Nation, has failed to absorb any of the net increase in employables resulting from our rising population. With the present rate of technological change in the steel industry, in the course of a short period of time thousands fewer workers will be employed than at present, unless the maximum workweek is further reduced to the level of approximately 30 hours a week at prevailing earnings or more.

In conclusion I want to refer to the proposal which I mentioned at the beginning of my statement for a national unemployment conference, to be called by the President of the United States, of leaders of Government, industry, labor, and farm groups. A conference of this description would obviously necessitate a broader discussion of our whole national economy, and encompass an exchange of ideas that might develop constructive proposals to which each of the groups represented in such a meeting might subscribe. It necessarily would entail lengthy discussion that presupposes a healthy development of long-range economic planning. It seems to me that the suggestions which I have offered your committee could very well be made effective by the Federal Government, pending the outcome of the joint deliberations of the participants in the conference which I have suggested.

That concludes my statement to you, Mr. Chairman, and added to the statement, as you will note, are a number of exhibits and a great deal of material which I would like to have in the record.

The CHAIRMAN. The exhibits have been admitted as we went along.

Dr. ANDERSON. The hearings for Monday begin with railroads, two successive days of railroad hearings Monday and Tuesday. The first witness is Mr. Pelley.

The CHAIRMAN. Of the Association of American Railroads.

Dr. ANDERSON. Mr. J. J. Pelley, president of the Association of American Railroads; Dr. J. H. Parmelee, Association of American Railroads; and presumably Mr. Norris, president of the Southern Railway, will present the data for railroads on Monday. On Tuesday

we will have Mr. George Harrison, president of the Brotherhood of Railway Clerks, Mr. A. F. Whitney, president of the Brotherhood of Railroad Trainmen.

The CHAIRMAN. When the committee recesses it will recess until Monday morning at 10:30.

Before I go for a vote in the Senate, Mr. Murray, may I express my personal gratification at your presentation here today and the appreciation which is felt I know by all members of the committee. We were very glad to have you here and we feel that you made a distinct contribution to this study. It may be that some members of the committee may desire to question you a little bit further, and I will ask Mr. O'Connell to preside.

(Mr. O'Connell assumed the chair.)

Dr. ANDERSON. I have a few questions that I think are of importance, even though the hour is growing late. Mr. Murray, in your exhibits, you have a very important document concerning ghost towns, Exhibit 2478, which refers, as I take it, to New Castle, Pa., only. I wonder if you could describe for us what is occurring in this unusual phenomenon in industrial cities and towns of ghost towns caused by technological changes in steel manufacture.

Mr. MURRAY. If I may be permitted, Mr. Chairman, to offer New Castle as a typical situation of a number of towns that are commonly referred to now in the steel industry as ghost towns, the city of New Castle has a population of approximately 50,000 souls. The community is one which was almost wholly dependent upon the steel industry, some 5,000 steel workers being employed in recent years there at the Shenango and New Castle works of the United States Steel Corporation. A few years ago, approximately 6,000 were employed in the steel industry in those two works at New Castle.

The employment of those 6,000 people, pay roll, earnings, cooperated toward the upbuilding of a very flourishing community—street railways, mercantile establishments, other small business enterprises which leaned rather heavily upon the local basic industry. Large municipal buildings, churches of all denominations, reflected the pride of these 50,000 people who had been living in this community down through the years. The decision of the United States Steel Corporation, for business reasons, permanently to abandon the Shenango and New Castle works, immediately threw the entire working population of the city of New Castle out in the streets. That originally took place in November 1937 at New Castle, and later, in 1938, took place at the Shenango works of the same corporation. Since 1938 when the Shenango works closed down, 72 percent of New Castle's 50,000 people are living on relief in one form or another.

The investments of the people in that community that have grown up throughout the years have disappeared. The values of real estate have been completely dissipated and are gone. Civic bodies, political organizations, businessmen, leaders of its various churches in that community, have had committees come over to see me in Pittsburgh about what it was that we might be able to do to help them. I have conveyed them over to the offices of the Steel Corporation, with prayer on their lips that the Corporation might do something about reopening those plants and producing work.

Mr. PIKE. They might as well have put one of those strip mills back in that same town, mightn't they? Did you ever find out why they didn't?

Mr. MURRAY. I don't know.

Acting Chairman O'CONNELL. But the strip mills which resulted in the closing of these mills were built in some place other than New Castle.

Mr. MURRAY. I can describe that, of course. Only last week the leaders of business and the leaders of religion, the leaders of labor, the leaders in the field of politics, had a meeting in New Castle to see what they might be able to do through local incentive to promote local enterprise and at least give some of their people work.

Now that is one town, the city of New Castle, 50,000 people. One fell swoop on the part of the Steel Corporation has created for that community the most despairing condition that I know of anywhere in America for such an extraordinarily large number of people.

The Steel Corporation has closed its Mingo Junction plant down there close to Steubenville, Ohio. Mingo Junction is a community of some 9,000 or 10,000 people. Business houses, churches, homes—their values have all been completely dissipated as the result of the decision of the Steel Corporation to close its Mingo Junction plant now.

Martin's Ferry, the same; the Monessen plant of the Steel Corporation, the same; the Elwood plant of the Steel Corporation in Indiana, the same.

These ghost towns which have been created as the result of this mass laying off of people, mass discharge, thousands of people, constitute a very, very serious problem. I have had their committees representing the city council, the local business organizations, come over here to Washington, journey down to the Department of Labor, come over here to see their Congressmen; they have gone down to New York to meet with the executives of this corporation to see what could be done about it. The reply of the corporation has always been that competition, new skills, new efficiencies, new techniques in production, have forced them to do the things which they are doing.

Mr. PIKE. That doesn't explain why they moved away, though. Isn't there a good supply of labor? What is wrong with the locality as the place to put a strip mill? Did they ever tell you that?

Mr. MURRAY. Perhaps Mr. Ruttenberg can tell you what is wrong with the locality there.

Mr. RUTTENBERG. This question is partly tied up with the consolidations. All these plants Mr. Murray has been mentioning were formerly part of the American Sheet & Tinplate Co., which was concentrated with the Carnegie-Illinois in 1936.

Mr. PIKE. That was all corporate fiction.

Mr. RUTTENBERG. With the abandonment of the American Tinplate plants, the products they produced, sheet and tin plate, are being coordinated with Carnegie-Illinois with its other organizations. Consequently the Irvin strip mill, the most recent and largest in the industry, opened in 1938 by the United States Steel Corporation, is adjacent to the large byproduct coke ovens of the corporation that supply the gas that is used in some operations in Irvin. It is close to the plant that produces the slabs that are rolled into semifinished steel products at Irvin, and it is likewise located on the river, the Monongahela, and river transportation is available.

It is estimated that the cost of production in a strip mill at Irvin is approximately \$5 a ton cheaper than it could have been in New Castle because of the transportation to and from semifinished and finished products.

Mr. PIKE. They didn't make the ingots at New Castle?

Mr. RUTTENBERG. No.

Acting Chairman O'CONNELL. It was the same reason that resulted in their determination to build the plant at Irvin rather than at New Castle; in other words, it was purely a matter of business policy on the part of the company, and had to do with how efficiently they could do it.

Mr. RUTTENBERG. It had to do with bringing their plants together. New Castle is an inland town and Mingo Junction and Martin's Ferry are along the river.

Mr. PIKE. They would save a heap by this move.

Dr. ANDERSON. I would like to ask one or two questions more about the ghost town situation which you have so graphically portrayed. Is this an inevitable accompaniment of mergers due to the technological advance of the steel industry, as manifested in the continuous strip-mill process?

Mr. MURRAY. Well, it is a manifestation of what occurs when large consolidations are effected, and savings in producing costs, and so forth, result. I assume that the reason for the Steel Corporation's building of a tremendous continuous stripping mill at Irvin, near Clairton, was that it was good business on the part of the Steel Corporation from the standpoint of economics. The Irvin works gives employment to some 4,200, three shifts. These 4,200 men, plus the machinery which is provided for them there, are capable of producing a quantity of goods sufficient in size to meet the combined productive efficiencies of some 18,000 or 19,000 workers who were employed in those old hand-mills before the Irvin works was produced.

Mr. PIKE. That is almost entirely a new works, isn't it?

Mr. MURRAY. It is a new works. It went into operation in full last year. However, it isn't confined to the United States Steel Corporation.

Mr. PIKE. Of course, not.

Mr. MURRAY. I read into the record today where Republic has been doing it, Bethlehem has been doing it, and they have all been doing it from the standpoint that they contend it is good business practice.

Mr. PIKE. In Bethlehem, we might say Lebanon is practically discarded, or are you familiar with that?

Mr. MURRAY. I know there have been continuous changes taking place in the closing up of certain mills in given plants, and the centralization of their production facilities at certain other points, but the transportation that has taken place in steel is extraordinary, and the impact of it has been felt very hard during the past 3 years.

Mr. PIKE. Yes; it shows very clearly here.

Dr. ANDERSON. That leads me to the point that I wanted to get some information on, namely, with this increasing tempo of mergers, somehow linked with a different type of manufacture based on the new technology, is it your feeling that more or fewer ghost towns can be anticipated in the immediate future?

MR. MURRAY. I think we are safe to assume that there will be more ghost towns. I didn't disclose the names of these 18 companies that I talked about here today, but I am prepared to give them to the committee in confidence, and at least 10 of those companies are the only establishments in their communities.

DR. ANDERSON. And that means 10 ghost towns.

MR. MURRAY. It means that there are 10 small communities that will be confronted with a state of distress akin to that prevailing in New Castle and elsewhere.

DR. ANDERSON. That leads me to the question as to whether you have a suggestion to add to your list of suggested things to be done with respect to social policy affecting ghost towns.

MR. MURRAY. I have suggested that the matter of final detail with reference to the introduction of new machines in industry, and particularly as those things relate to the regulation in a legislative way, is one that might very well be a subject of conference. I have suggested here that none of these things should take place in this country of ours without ample notice in the first instance, and then means of compensation provided for the directly affected communities and individuals.

INDUSTRIAL COOPERATION INVITED

MR. MURRAY. I do think that unless industry moves to do something about it cooperatively with labor, the only answer to the situation lies in providing proper legislative enactment here, the details of which I of course will be prepared to discuss with any congressional committee at the proper time.

I might say here that our research forces at the offices of the Congress of Industrial Organizations are preparing a considerable amount of material to be presented to your committee at a later date upon the whole national economic situation, national industrial situation, and Mr. Lewis has asked me to come over here and present it for the C. I. O. at that time. No doubt that will encompass some other suggestions with relation to these legislative enactments about which I am talking here today.

DR. ANDERSON. In your contacts and deliberations and negotiations with management and industry, would you care to say whether there is a spirit comparable to the one that the Senator manifested today, and you, with respect to the need for an immediate attack-upon this problem?

MR. MURRAY. Well, in my confidential discussions with the magnates of industry—and I have many of them, dealing in a business way with our collective bargaining arrangements—there has been no disagreement with me that something will have to be done. They don't offer any particular remedy, but confidentially they are willing to indicate to me a desire to be cooperative at the proper time. But their fear lies evidently in the inability of any one industry to solve this problem by itself.

I have talked to leaders of the National Manufacturers Association. Mr. Howard Coonley addressed a meeting with me at Des Moines, Iowa, a few weeks ago, the Farm Institute meeting. I posed to the farmers a suggestion of a national congress to bring the leaders of business and the leaders of labor and the leaders of finance

and government and agriculture together, and while Mr. Coonley didn't suggest publicly a willingness to do those things, after the meeting was over he came around and said, "I think that is a good idea. I think we ought to get together. I think something ought to be done about it."

Now Mr. Coonley, I suppose, is an estimable fellow. It may be that he is willing to try and do what he can about it, I don't know, but he at least indicated a willingness to participate in a meeting.

I presented to the President of the United States 3 years ago a desire on the part of labor to bring all of these forces together under one roof, around one table, and talk it out, not in a spirit of selfishness or one trying to take advantage of the other, but the group to be brought together for the purpose of rendering a service to this country, doing something about it. I find no indication from the administration of any desire on their part to do anything about it, insofar as holding a meeting is concerned. Perhaps they are going to find a panacea here. They might find it here. I hope they do.

But I am constrained to believe that unless the Federal Congress moves to arouse the interest of the people of this country in the need of bringing these special groups together, working out an agreement, our situation is going to get much worse than it really is today. It simply has to be stopped, and we can't fool or temporize much longer with it, and the only way to stop it is for the service of these important men in this country to be drafted, commandeered. Tell them, "You are citizens of the United States, you have a task to perform to help reconstruct the economy of the greatest democracy in the world. You have got a job to do to save human beings," and labor should help to do that job just as unselfishly as business must. But it has got to be tackled on that basis.

Acting Chairman O'CONNELL. I would like to ask you one question which related to one of your recommendations in your statement. You referred in your statement¹ to the possibility that congressional measures might be enacted which would be designed to pass on to consumers generally the economic benefits of technological improvements which apparently you assume or believe are not being passed on at this point, or at least not being passed on rapidly enough.

What do you consider to be some of the factors which prevent the benefits of those technological improvements from being passed on at the present time?

Mr. MURRAY. I don't know. I don't charge business here with violating any law.

Acting Chairman O'CONNELL. No.

Mr. MURRAY. Or fixing any prices.

Acting Chairman O'CONNELL. I have heard that they have been known to.

Mr. MURRAY. But evidences are at hand which very well indicate that although the cost of producing steel has gone down, at least during the past 18 months, the price of steel has gone up.

Mr. PIKE. I believe we call it stabilizing, Mr. Murray.

Mr. MURRAY. There might be something akin to the word "stabilizing" being used there.

¹ See p. 16509.

Acting Chairman O'CONNELL. You were thinking in part, I take it, of monopolistic practices or the power of very large, highly integrated industrial organizations to control their prices and products, and that sort of thing, were you not, to some extent?

Mr. MURRAY. Oh, yes. I am speaking as a citizen, a taxpayer, and I am very much opposed to monopolistic tendencies or practices wherever they may develop.

Mr. PIKE. This is one of those instances, going back to the strip mill, where they have passed on quite a bit to the consumer. Really their price per ton to the customer has dropped quite substantially. I don't think there is any argument about that. At least I haven't heard any. But so many other things have happened where the saving has been much more reluctant to get on to the final consumer? In this case it looks as if there had been a good part of the saving passed on.

Mr. MURRAY. I have no argument to make here about any monopolistic practices in the steel industry with reference to the fixing of prices, or anything like that.

Acting Chairman O'CONNELL. But in part you had in mind the general desirability of either under existing law or more effective laws making competition work, I take it.

Mr. MURRAY. We believe technological advancement lends itself to increased productivity and the lowering of cost and the passing of savings on to the consumer.

Acting Chairman O'CONNELL. I think we would all agree it is very desirable and very essential that such benefits do be passed on in order to bring about the necessary increased ability to purchase on the part of the masses of people, but this statement implied that to some extent at least the benefits of technological change were not being passed on, either at all, or at a sufficiently rapid rate, and it occurred to me you had in mind the general desirability of effective legislation or enforcement of legislation involving such statutes as the Sherman Act.

Mr. MURRAY. I think the implication there might very well also be one of not expanding employment to reduce the cost, pass it along to the consumer—that there is a complete sense of social irresponsibility, I mean, in these procedures that have to do with the introduction of machines. The corporation or management under present competitive practices merely resorts to the expedient thing, the thing that will effect an immediate saving to meet the price of a competitor, somebody somewhere else that has the same kind of a machine.

Acting Chairman O'CONNELL. Isn't that almost essential, assuming a competitive situation?

Mr. MURRAY. I am not going to dwell in the realm of these mysterious things with you here today, Mr. Chairman, about what all these competitive practices might lead us into. I read a lot about them, but the more I read them, the more confused I become. My interest here today runs mostly toward this one thing of unemployment, and I unfortunately have created an impression in this implication here of something that I didn't really intend.

Acting Chairman O'CONNELL. Have you any other questions, Dr. Anderson?

Dr. ANDERSON. No.

Acting Chairman O'CONNELL. As the Chairman said, we are very grateful to you.

(The witness, Mr. Murray, was excused.)

Dr. ANDERSON. Before the committee adjourns I would like to introduce as an exhibit a description of the terms which we have been dealing with, which we have worked out, to be printed in the record for your use in the discussion of the data as it develops.

Acting Chairman O'CONNELL. It will be printed in the record.

(The document referred to was marked "Exhibit No. 2490" and is included in the appendix on pp. 17346-17349.)

Acting Chairman O'CONNELL. The committee will stand in recess until Monday morning at 10:30.

(Whereupon, at 4:30 p. m., an adjournment was taken until Monday, April 15, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

MONDAY, APRIL 15, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Friay, April 12, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, of Wyoming, presiding.

Present: Senators O'Mahoney (chairman); King, and White; Representatives Williams and Reece; Messrs. O'Connell, Hinrichs, Pike, Kreps, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; Frank H. Elmore, Jr., Department of Justice; and Dewey Anderson, Economic Consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman, we open this morning with evidence on the railway systems of America, the effect upon them of technological improvements, and the two witnesses for today represent railway management. Mr. J. J. Pelley is the first witness, president of the Association of American Railroads, located in Washington, D. C. Following him will be J. H. Parmelee, with the Association of American Railroads, who will present a detailed analysis of the railway structure and its development.

The CHAIRMAN. Mr. Pelley, you haven't appeared before us before, have you?

Mr. PELLEY. No.

The CHAIRMAN. Will you be sworn, as is our custom?

Do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. PELLEY. I do.

The CHAIRMAN. You may proceed.

TESTIMONY OF J. J. PELLEY, PRESIDENT, ASSOCIATION OF AMERICAN RAILROADS, TRANSPORTATION BUILDING, WASHINGTON, D. C.

Mr. PELLEY. At the outset let me emphasize that our railroads constitute a progressive, dynamic industry, seeking at all times new means of producing more efficient, more economical, more adequate transportation service. This has been true in the past, it is true today, and it will be true of the future.

Ten years of economic depression and an even longer period of subsidized and growing competition have forced the railroad industry greatly to curtail annual capital improvement work, purchases of fuel, material and supplies, and normal employment. The handicaps with which the industry is now faced are great, but they are not insuperable. They can be surmounted, and the industry will again be in the market on a large scale for new equipment, new rail and cross ties, ballast, fuel, and many other items of materials and supplies. Improvement work requires employment of additional labor, both in the railroad industry and the industries from which it buys supplies. An increase in traffic to more nearly normal levels will also mean additional employment for railroad maintenance and operating forces.

I need point only to the year 1937 as an illustration of what I have in mind. That year represented the culmination of 4 successive years of improvement in traffic and earnings from the depths reached in 1932 and 1933. Even in that year, 1937, earnings were far from adequate for the real needs of the industry, yet capital expenditures for the year exceeded \$500,000,000, purchases of fuel, materials, and supplies approached \$1,000,000,000, while railroad employment exceeded 1,100,000 persons.

Then came the recession of 1938, and retrenchment again became necessary in order to keep expenditures within the limits of revenues. Capital expenditures fell 55 percent under 1937, railroad purchases were reduced 40 percent, while railroad employment declined 16 percent.

TECHNOLOGICAL CHANGE IN THE RAILROAD INDUSTRY

Mr. PELLEY. Technological progress has always been a factor in American railway history; it has not developed overnight. The application of steam as a source of energy to means of locomotion was one of the outstanding technical advances in the history of civilization. From the early days of the railroad down to the present time, progressive improvement has taken place in equipment, in track, in signaling, in the development of automatic devices, and in the use of coal, fuel oil, electricity, and other modern forms of power. Hand in hand with these physical betterments have gone improved organization and operation.

These factors have always been at work in the railroad as well as other industries; otherwise we would have a stationary economy. The record of railroad expansion in this country to Nation-wide proportions is one of the vital chapters in American history. It was accomplished by continuous and consistent progress in the technical field.

More recently, in the absence of technological advance, the industry would have been unable to render the efficient services required of modern transportation agencies. As it is, railroads are giving the public the fastest, most efficient, and most satisfactory service in their history.

Mr. HINRICHS. Mr. Pelley, may I interrupt at that point? I misread that thing so badly that from the point of view of the record you may want to emphasize the fact that there have been technological advances and not an absence of them, that if you had not these technological advances you would not have had the efficient service that you have been getting.

Mr. PELLEY. That is right.

The CHAIRMAN. What you meant was that more recently, without the technological advances which have been developed, the industry would have been unable to render such efficient service.

Mr. PELLEY. That is right.

Technological factors are closely intertwined with what I may call economic factors. The latter include traffic, rates, earnings, relations to the Government, and finally the extent of competition.

While there has always been a relationship between economic and technological factors, the economic factors of the past were of a different type from those of more recent years. During the earlier years of railway development the country was expanding, its population was spreading over the whole country, and competition existed to only a limited degree. The problem then confronting the railways was to keep ahead of the growing transportation demands of the country. This called for large investments and large-scale expansion of facilities, as well as purely technical improvements in plant and equipment. The principal stimulus to technological progress in those days was the urgent need for more mileage, more equipment, and more men to operate the plant. This stimulus was added to the incentive that is always present in a business enterprise, namely, so to conduct the enterprise that it will produce a return on investment.

In more recent years the problem has changed from one of rapid physical expansion to one of an intensive struggle against depression, and against growing competition. With the advance of highway and waterway construction, the latter completely and the former to a large extent subsidized by government, a great decrease in railway revenues has occurred, aggravated by reductions in rates made necessary by subsidized competition with the railroads.

In the past, today, and in the future, the railways have applied, and will continue to apply, the principle of mass production that has been so effective in building up manufacturing and producing industries. In the railway field this principle takes the form of mass transportation. In no other transportation industry, except perhaps on the Great Lakes and the high seas, is it possible to handle large aggregates of freight more efficiently and at lesser cost per unit. This principle has been sound in the past and will continue to be effective in meeting future competition.

The railroad industry has been struggling against serious handicaps in recent years. One handicap has been economic depression, which has seriously influenced the trend of railroad traffic and earnings. This situation is complicated by such economic changes as decentralization of industry, development of hydroelectric power, and substitution of fuels and other materials, all of which tend to reduce the total volume of goods transported.

Secondly, there has been increased competition from other agencies of transport. To meet these difficulties, railroad managements have adopted every possible means of operating efficiently and economically. They have reduced operating expenses in approximately the same ratio as revenues have declined. They have reduced the cost of handling the average ton of freight 1 mile and the average passenger-train cars 1 mile. This they have done by introducing specific measures of economy, by installing every possible means of improving their plant, their rolling stock, and their methods of operation, all of which constitutes technological progress.

What the industry needs in order to meet its competitive handicaps is equality of treatment by the Government as between the railroads and other agencies of transport. We believe that each transport agency should be required to pay its own way. None should occupy a position in which it receives special favors from the Government, and each should be under the same general type of regulation as other agencies.

I believe the adoption of this principle as a national policy is on the way, although its development is a slow process. But to the extent that it is adopted and put into effect, railroads will be enabled to meet their present handicaps. With these handicaps removed, the industry will go forward in its field. I, for one, do not hold the view that we have reached the ultimate in railroad development.

The railroad industry must continue to progress. The pressure of competition will exert a strong influence. We do not fear that competition if it is fair competition, for it can be met by further advances in technology. The industry will adopt and adapt itself to all kinds of improvements growing out of chemical, physical, technical, and other discoveries and inventions. To do otherwise would be to fall back in the race for its rightful place in the economic organization of the country.

To keep abreast of progress, new money will be required. New investment will be needed for further modernization, replacements, and improvements to plant. The margin of profit on which the railroads have been and are now operating is so small that they must look to the money market for large sums of new capital in the future if they are to hold their own in the field of technological progress. They can secure those funds if the competitive handicaps I have referred to are removed.

Specifically, it has been estimated that the railroad industry would be justified in spending \$500,000,000 or more annually for new and improved equipment, rail, ties, ballast, machinery for shop and track work, and other capital improvements. The average capital program of the railroads over the period from 1923 to 1930 was \$843,000,000 per year; since 1931, the average has been only \$259,000,000 per year.

FUTURE PROGRESS

Mr. PELLEY. The effect of future technological progress on railroad performance and employment will be a definite one, although it is not easy to outline it in specific terms. If and when the railroad industry is relieved of the handicaps against which it is now struggling, it will be able to regain much of the traffic it has lost and should, in addition, obtain a larger proportion of the future increase in freight and passengers than it now has.

The future volume of employment in the railroad industry will depend largely on the trend of traffic and earnings. With a return to better economic conditions, and removal of the competitive handicaps now confronting the industry, railroad traffic may show so great a future increase that even with increased efficiency in handling it a greater number of employees will be required. Railway managements will be more than glad to increase their forces under such conditions.

It should not be overlooked that technological progress in the railroad field stimulates employment in other industries. Purchases of equipment, rails, ties, machinery, and other products from other industries tend to increase employment in the shops and factories of those companies from which railroads buy, and which prosper only when the volume of railroad purchases is on a high level.

I close, as I began, by emphasizing that the railroad industry is a dynamic industry, that it will continue in full force and vigor for many years to come, and that it will progress in the field of technology in the future as in the past.

That is all of my direct statement, Mr. Chairman.

Dr. ANDERSON. Mr. Pelley, before the questions which I know will come readily from the committee members, the railroad industry is a highly regulated industry, is it not?

Mr. PELLEY. Yes, sir.

Dr. ANDERSON. That is, if you propose to do anything which in any drastic way affects the number of people employed or the wage rates paid, what must you do about it?

Mr. PELLEY. Which one do you want me to answer?

Dr. ANDERSON. Let's take both.

Mr. PELLEY. We have to get the approval of the Interstate Commerce Commission for most of the things that we do.

Dr. ANDERSON. So that the railroad industry would represent something different than we have had heretofore in these hearings in that we are now looking at a highly regulated, monopolistic industry.

Mr. PELLEY. That is correct, and it is an industry that has been regulated for a long time.

Dr. ANDERSON. You have been a practical railroad man for many years, Mr. Pelley?

Mr. PELLEY. Yes, sir.

Dr. ANDERSON. And you have seen the effects of the up and down swing of the business cycle, employment and unemployment through the years.

Mr. PELLEY. Yes, sir.

TOTAL LABOR FORCE ON THE RAILROAD

Dr. ANDERSON. What is the total of persons normally regarded as railroad men in the country, have you any idea?

Mr. PELLEY. At one time there were 2,000,000; probably there are now 1,200,000 or 1,300,000.

Dr. ANDERSON. With the present volume of employment in the railroads, then how many persons customarily employed are not now engaged in railroad work?

Mr. PELLEY. Well, it is a little difficult to give an accurate estimate of that. We now employ about 1,000,000 men. Just how many of them have waited around for employment, or gone elsewhere, it is pretty difficult to say, because many of them have had to wait a long time; some of them couldn't wait, they had to seek employment elsewhere. I think it is a safe figure to say that probably 1,100,000 men are now looking to employment in the railroads.

Representative WILLIAMS. Right in that connection, when was it at its peak of employment?

Mr. PELLEY. In 1930. We had about 2,022,000 men employed in 1930, and that was the peak, Mr. Williams.

Dr. ANDERSON. Since that peak time, these workers who were normally in the regular force of railway men have gotten older, some of them have dropped by the wayside, couldn't wait, as you say. You would fix the number that is not now employed at about 100,000 to 150,000?

Mr. PELLEY. Well, I repeat, it is rather difficult. If I am correct in saying that there are 1,100,000 men looking to the railroads for employment, and are either employed regularly or waiting for their turn with an upswing in business to be called back, then there would probably be 100,000 waiting, because there are about a million working now.

Senator KING. But from the peak of 1930, 900,000 have lost their jobs?

Mr. PELLEY. That is right, Senator King. Many of them have died or retired, and many of them have gone elsewhere, and probably many of them have given up hope of ever getting back to the railroads and have taken up work in other lines of business.

Dr. ANDERSON. What is the average of railroad workers?

Mr. PELLEY. Probably Dr. Parmelee could give you a little better answer on that than I could.

Dr. ANDERSON. You recognize, gentlemen of the committee, that Dr. Parmelee is following with a very detailed analysis of the railroad plant equipment and railroad force and I don't want to move into an area that he is going to explore.

Mr. PELLEY. I think he will be able to give you a very good answer to that figure.

Dr. ANDERSON. Except that I want to raise this point as a conclusion on the previous question about the number of people available for labor and not now employed.

If by some circumstance, almost a miracle, I suppose, the railroad business should go back to its height of prosperity in the immediate future, would there be a need for recruiting new labor other than those now waiting for work?

Mr. PELLEY. There would. I think, Mr. Anderson, it might help you in your question if I were to tell you that in 1937 we had pretty good business and then the railroads were employing some men who had never before worked on a railroad; they were looking for new men. They probably gave some of their old men the call and they were employed somewhere else and did not want to give up their chances where they were to come back to what might be temporary employment on the railroad, so they had to seek the men; they even hired new brakemen. I know of some cases where they hired new men in transportation service in 1937.

Senator KING. So in 1937 you took on new men, and doubtless you would give preference to the old men, that is, to those who had been in the employ in the past.

Mr. PELLEY. That is right. We always give preference to the old men, and by agreement, for that matter, which we are very glad to do. They have the first call.

Senator KING. That situation would indicate, would it not, that between 1937 a considerable number of that 900,000 had found positions in other fields of employment?

Mr. PELLEY. Yes, sir; and some of them were so well located that they did not want to come back, consequently some of the railroads had to hire some new men who had never before worked on railroads.

Representative WILLIAMS. About how many new men were taken on in 1937? Covering the period, we will say, from the lowest depression, to what extent was the railroad employment increased, say, from '32 or '33, whenever it was at its lowest ebb, to '37, when it reached its highest point?

Mr. PELLEY. Probably 150,000 men, Mr. Williams, I should say, as a quick estimate, from the depths of the depression in '32 and '33 to the peak of '37, probably 150,000 men.

Representative WILLIAMS. And what proportion would you say of those were new men? Have you any idea about that?

Mr. PELLEY. Very few.

Representative WILLIAMS. Since that time what has happened with regard to employment?

Senator KING. Since '37?

Representative WILLIAMS. Since '37.

Mr. PELLEY. We are down about 100,000 men.

Representative WILLIAMS. Since '37 you say there is 100,000 off. What has become of those men? Where are they and what are they doing?

Mr. PELLEY. Some of them are waiting to be called, some of them probably are not employed at all, and some of them have found something to do elsewhere.

Senator KING. Some availed themselves of their retirement privileges, too, did they not?

Mr. PELLEY. Yes; quite a number of them. You could probably get in a taxicab here in Washington and find drivers who are furloughed firemen on some railroad. I have, a number of times. They find something to do—some of them; some of them don't, waiting to be called back.

Representative WILLIAMS. Is there any particular line of the railroad industry from which the majority of those were let out of employment, or was it general?

Mr. PELLEY. Pretty general. I should say more in the maintenance department, maintenance of equipment and maintenance of way, than in the transportation departments.

Representative WILLIAMS. And those were the lower paid employees?

Mr. PELLEY. Yes.

Senator KING. I suppose there is considerable reduction in the number of employees in the mechanical departments and in those departments or branches of the industry which manufactured cars and engines.

Mr. PELLEY. That is right, Senator King, and of course the time comes when the only men you could get are in maintenance; if you run trains you have got to employ men, but you can defer maintenance; that is what railroads generally do when they are forced by financial circumstances to retrench.

Senator KING. There is very large obsolescence leading to obsolescence, if I may coin that phrase, in the mechanical appliances, engines, the cars, and so on.

Mr. PELLEY. Not so much as you might think. There are some, but it is not as aggravated as it is generally believed to be. The railroads have kept up their plants pretty well.

Senator KING. But the cars, with the usage to which they are subjected, whether rough or otherwise, do not last many years, do they? That is to say, you are constantly compelled to replace the cars.

Mr. PELLEY. Replace or rebuild. A rebuilt car will be nearly as good as a new car, and a rebuilt locomotive will be, not as good as a modern locomotive necessarily, but as good as that locomotive was once.

Senator KING. A large cost is inevitable, then, in the rebuilding of the engines and the cars?

Mr. PELLEY. Yes; but before a railroad enters into a rebuilding program it works out pretty scientifically what is the wise investment. Is it wise to rebuild or buy new? No railroad starts into any sort of a rebuilding program without analyzing just what is the better investment for it, to rebuild this locomotive, to rebuild this particular lot of cars, or to go in the market and buy some new ones. There is always some rebuilding, but the turning point comes there between the rebuilding investment and the new purchase investment, and they always take the one they at least believe to be the wiser.

COMPETITION WITH OTHER FORMS OF TRANSPORTATION

Senator KING. What is your greatest competitor, the river traffic or the trucks?

Mr. PELLEY. The highway.

Senator KING. The highway?

Mr. PELLEY. Oh, yes.

Senator KING. I suppose that has cut into your earnings, into your tonnage, as well as apparently into the passenger traffic very considerably.

Mr. PELLEY. Very considerably. If you were to ask me to give you a figure as to the extent of it I probably would say that they have taken 25 percent of our tonnage and probably 35 percent of our earnings, the explanation of that being that we lost to the highways not only the tonnage that has been lost but the revenue that has been lost by reason of the necessity of reducing rates in order to stay in the traffic at all. That feature of it is very aggravated, because I do not need to tell you gentlemen that when you reduce a rate you are just taking that money out of the net income. There is no way of knowing what the total of the two together would be, but I should say it is anywhere from 25 to 40 percent.

Senator KING. The Government and the taxpayers pay for the highway, to that extent helping the trucking and the automobiles, and you have to pay your own taxes.

Mr. PELLEY. That is right.

The CHAIRMAN. You pay a lot of taxes.

Mr. PELLEY. We pay a lot of taxes.

Senator KING. It is about \$800,000,000 a year, isn't it?

Mr. PELLEY. Mr. Parmelee will give you the exact figures.

Dr. ANDERSON. Is that what you mean by establishing fair treatment with respect to the competitors in the transportation business?

Mr. PELLEY. Yes.

Dr. ANDERSON. The future of the railroads depends, according to your statement, in a large measure upon establishing parity of treatment. How could that be done?

Mr. PELLEY. Well, it could be done in this way, simply by having all the agencies of transportation pay their own way and by regulating them on a fairly comparable basis.

The CHAIRMAN. How do you propose to make them pay their own way? What are the factors which in your opinion would constitute doing that?

Mr. PELLEY. Well, Senator, I have not come up here to criticize anybody, and far be it from me—

The CHAIRMAN (interposing). Any answer you give in response to a question by a member of this committee certainly can't be interpreted as criticism, and I think we ought to be able to take a little criticism if necessary.

Mr. PELLEY. Well, you get a lot of it; probably much of it isn't justified.

The CHAIRMAN. Just eliminate the word "probably," will you?

Senator KING. Use the word "deserved," perhaps.

The CHAIRMAN. Let each man speak for himself.

Mr. PELLEY. I didn't come up here to argue our case. I came here to tell you about railroad employment, and since I am asked a question, you asked me how this could be brought about. I suppose you gentlemen know that you appropriate large funds here to develop these inland waterways, to take traffic off the railroads.

The CHAIRMAN. We appropriate a lot of money for inland waterways and a lot of money for highways.

Mr. PELLEY. That is right. I think I had better analyze this just as I see it. I will attempt to put the responsibility where I think it belongs and I hope you will accept it as what I believe to be a fact.

The Congress has gone quite a distance to meet what my views are, at any rate, regarding regulation. They passed a motor regulatory bill about 4 years ago; trucks and busses are now under the Interstate Commerce Commission.

You have a bill passed here at the last session of Congress by both Houses, now in conference, regulating the waterways, and I would just like to pay my compliments to you on that, because I think you have done very well in recent years in trying to stabilize this industry insofar as Congress is concerned.

I doubt if there were ever two committees in Congress that have worked more diligently, more intelligently, than Mr. Lea's committee and Senator Wheeler's committee in working out the transportation problem. At the last session of Congress those bills were passed, and they are now in conference, and we are hopeful that at this session some law will come out of it, and the regulation of waterways is in both of those bills.

There is another feature in the two bills that I prize rather highly. There is a declaration on the part of Congress that all of these agencies of transportation shall be treated equally insofar as regulation is concerned; that declaration of policy, I believe, is in both bills, and

no doubt will be in the law. It is the first time that Congress has ever so declared itself.

Senator KING. The regulation would include rate-making, as well?

Mr. PELLEY. Yes, sir.

Senator KING. So when you speak about the regulatory provisions of the bill you include, obviously, the power to make rates for the waterways, and perhaps of highways?

Mr. PELLEY. Yes. The Commission now has the power to make rates with reference to highway traffic. Congress passed a law—I think it became effective in '35—and you are now about to pass, I hope, a bill that will give the Commission authority to regulate waterways.

Senator KING. Without taking any credit to myself in reference to the highways, I offered a bill many years ago for regulation of the busses and trucking, because of the obvious competition and the necessity of some form of regulation over the interstate transportation.

Mr. PELLEY. Now, to finish the national aspect of the waterway thing—and this is the important thing, as we see it—if the Congress is going to continue to appropriate large sums of money to develop inland waterways that are really not needed to handle the transportation of the country, and will result in taking that much traffic off the railroads, whatever it may amount to, we think that you ought to impose a toll or some basis of payment so that the Government will be reimbursed to some extent for all of this money. I don't think it is fair to our industry, and we do not think it is fair to the taxpayer, to be frank about it, to spend all this money and get none of it back, because these users of the highways which these funds are used to build and maintain, do not pay anything. I think in passing, I have some figures which might be of interest to you, and I think they are exactly correct.

The Government has spent in maintaining the 12-foot channel of the Ohio River about \$145,000 per mile of that river, and you spend about \$4,000 a year maintaining it.

Senator KING. Per mile?

Mr. PELLEY. Per mile. Now, I would just like to contrast that with the railroad situation. The average mile of railroad in the United States, fully equipped, cost \$62,000 a mile, against \$145,000 for this Ohio River, and it costs us an average of about \$2,000 a mile to maintain that railroad.

Now, we say this added transportation really is not needed in the outset, but if you gentlemen differ with that and want to provide it anyhow, then we think the users ought to pay for it.

That is the one big thing that Congress has to do with, in my opinion.

Mr. PIKE. May I ask this question, Mr. Pelley? In making that comparison, do you have the ton traffic on the Ohio, as compared to the typical mile of railroad you mentioned?

Mr. PELLEY. Not just in my mind, I haven't, but you know yourselves, I am quite sure, that the greatest use of it is made by large industries, and they don't pass it on to the consumer.

Mr. PIKE. Steel and fuel, very largely?

Mr. PELLEY. Very largely.

Now, this money is spent under the guise of cheap transportation to the consumer, and the people who are supposed to be the beneficiaries

of this cheap transportation don't get it at all. The large industries, many of them, use it, and they charge the consumer just the same as if it had been shipped by rail, the higher rate. So it is supposed to be cheap transportation, and it is transportation with a lot of hidden costs that are not generally disclosed, and the consumer doesn't get the benefit.

Senator KING. Is it true with respect to the steel industry, using it in a broad way, that on the greater part of the transportation—that is, from the Mesabi Range over the lakes and over the railroads which are owned by the steel companies—there is no subsidy from the Government?

Mr. PELLEY. No; not on the Great Lakes. I speak particularly of inland waterways. Now, I am still stating facts and not criticizing. Not only does the Government spend this money to provide these waterways, they have gone into the business themselves, operating on the Mississippi and Warrior Rivers. I think I can——

Senator KING (interposing). That is what General Ashburn has been handling for many years since the war?

Mr. PELLEY. Yes; inaugurated, I was told at the time, in 1919, to help the railroads handle the business and inaugurated as an experiment, with the intention of selling it to private interests later on. Nothing of that kind has ever happened, and it is being expanded. We think that the Government ought to go out of that business.

Now, that is supposed to be cheap transportation. I am told that a very large percentage of goods that move into Mobile, Ala., for illustration, move in by barge, and the retail prices in Mobile are higher than they are in the outlying districts which it is impossible to reach by the barge line. I mention that only to point out that the consumer really does not get the benefit of it.

Mr. O'CONNELL. How would it help the railroads if that barge line were sold to private enterprise?

Mr. PELLEY. I think it would help them in this way: It would be put on a true basis, then, if private industry could operate the barge lines at a profit.

Mr. O'CONNELL. Has General Ashburn's organization operated at a loss?

Mr. PELLEY. Well, yes.

Mr. O'CONNELL. I understood the contrary.

Mr. PELLEY. I know; but I say yes.

Senator KING. The capital has all been furnished by the Government, and that is all loss.

Mr. PELLEY. I wouldn't say General Ashburn would agree to that, but the facts are it has been operated at a loss.

Representative REECE. Is there any shortage of transportation facilities in this area proposed to be served by the conflicting project?

Mr. PELLEY. There is not. There is not any shortage of transportation anywhere in the United States of that kind. There is a large surplus everywhere.

Dr. ANDERSON. Moving then to a conclusion——

Mr. PELLEY (interposing). Would you mind—I wanted to answer Senator O'Mahoney.

The CHAIRMAN. I don't think we have reached a conclusion yet.

Mr. PELLEY. My conclusion is, either stop appropriating money to develop the waterways that are not needed, or make the users pay.

On the highways, I don't see a great deal that Congress can do about that.

The CHAIRMAN. But you regard the highway appropriations as in part at least Government subsidy for a railroad competitor?

Mr. PELLEY. We do, Senator, but we have never gotten into the position, and probably never will—at least, I won't—of opposing highway construction. Some highway construction I might oppose, but generally people want good highways—I like them myself—and we don't want to get in that position.

The CHAIRMAN. The reason I asked you the question, of course, was because of your statement that what the industry needs in order to meet its competitive handicaps is equality of treatment by the Government as between the railroads and other agencies of transport.

Mr. PELLEY. That is right.

The CHAIRMAN. So, obviously, you were dealing with more than the waterways.

Mr. PELLEY. That is right. Did I say "the government" or "government"?

The CHAIRMAN. You said "the government."

Mr. PELLEY. I meant all government.

Now the highway problem is very much a State problem. The State decides what they shall pay, not the National Government, and therefore it is a matter that has got to be handled in the various States, and what we say is that we ought to make them pay what they should pay for the use of the highways, and then restrict the sizes of these motor busses and trucks to dimensions that the other 25,000,000 users of the highway feel is fair and right, and that is all.

The CHAIRMAN. Did you happen to hear or read the recommendations that were made to this committee last Friday by Philip Murray, head of the Steel Workers Organizing Committee?

Mr. PELLEY. No, sir.

The CHAIRMAN. I think you might have been interested in them because the thought that comes to my mind is that you and he are taking just about the same position, but with respect to a little different problem.

Your position is that the Government, both State and national, should do something to help the railroads against the competitive handicaps which are imposed upon the railroads by reason of technological advance in the construction of waterways and highways; and that these new advances, competitive modes of transportation, should be made to pay their own way. Now Mr. Murray's position was that the steel worker is suffering because technological advance in the development of the continuous steel mill has displaced him. He is suffering from the handicaps of competition just as the railroads are. So Mr. Murray suggested to us that we make the technological advance, namely, the continuous steel mill pay its way, just as you suggest that we make the highways and the waterways pay their way.

Now, his suggestion, of course, is that the displacement of labor by the continuous mill should be regarded as one of the costs of this technological advance, so that human labor would not have to bear so much of the brunt, that is particular human labor. Your position is that the railroads themselves should not be compelled to bear the whole burden of this advance.

Mr. PELLEY. That is right.

The CHAIRMAN. Do you think that this comparison is out of line?

Mr. PELLEY. Well, I don't know, Senator. Maybe the steel companies are bearing it now. I really don't know.

Dr. ANDERSON. Mr. Pelley, with respect to—

The CHAIRMAN (interposing). I was going to ask another question.

Mr. PELLEY. May I elaborate a little more on this thing and I think I will clear it up. In these States I said some progress is being made. You know, we say the highway people don't pay what they should. Some of them say they do. Not all of them, but some of them say they do. We go along and don't get very far with it. You may or may not know that this Committee of Six that was appointed by the President suggested that a temporary board be appointed to determine just that factor. There is nobody to determine it. Nobody says who is right. We say that they don't pay, and they say, some of them, that they do.

The reason I am encouraged about it and think we are making some progress, the States have begun to look into it. They are spending all these millions of dollars and not getting it back, and the time has come when they have got to look at it and see where the money is coming from. In two States—Illinois and Missouri—the State authorities on their own account have made a very comprehensive study to determine whether or not the commercial use of the highway is subsidized, and in each case they found that the commercial user is subsidized.

I feel if these other States would make the same sort of study, they would find the same facts. And then it is their job, it is the respective State governments' job to regulate that, and I think they are going to be forced to soon because they just can't keep on paying out, spending many millions more each year than they get back for the highways, and I think necessity will force them to do that.

The CHAIRMAN. Have you finished that statement?

Mr. PELLEY. Yes.

The CHAIRMAN. When I was called to the telephone, I understood you testified that the peak of labor employment by the railroads was reached about 1920?

Mr. PELLEY. That is right.

The CHAIRMAN. And how many persons were employed then?

Mr. PELLEY. The exact figure I would say is about 2,022,000—say 2,000,000 men.

The CHAIRMAN. And employment fell off thereafter, reached a low, and then picked up again and reached another high point in 1937?

Mr. PELLEY. Yes.

The CHAIRMAN. It was then how much?

Mr. PELLEY. About 1,100,000.

The CHAIRMAN. Now, today, what is the employment?

Mr. PELLEY. About 1,000,000 men, in round figures.

The CHAIRMAN. Now the railroads have recognized, have they not, the importance of taking care of displaced labor in the so-called Washington agreement?

Mr. PELLEY. Yes.

The CHAIRMAN. Briefly, what is that agreement?

RAILROAD LABOR POLICIES

Mr. PELLEY. Senator, I think I should explain that. Since you brought that up, the natural question here is, What can the railroads do about this labor? Of course, there are some things we can do and there are some we can't do, and I wish I had something constructive to suggest to you that might be done, but I can tell you what we do in taking care of our employees. I believe the railroads are the first to have a voluntary pension plan. My information is that the first voluntary pension plan in this country was made in 1882. Now, the railroad I worked for for many years established a voluntary pension plan 39 years ago, in 1901, and these pension plans have been fairly liberal. For every year that he was in the service, a man would get 1 percent of his average salary during his last 10 years in the service. To state that precisely, if a man had worked 40 years and had averaged \$100 a month, he would get \$40 a month pension as long as he lived.

Well, some 90 percent of the railroads, probably 95, had these voluntary pension plans. A few had none, and, of course, the men wanted a pension on all roads.

The CHAIRMAN. When you speak of a voluntary pension plan, you mean that the railroads themselves adopted the plan voluntarily?

Mr. PELLEY. Voluntarily, and paid all the costs.

The CHAIRMAN. And the workers were not required to pay any part of that cost, is that a correct understanding?

Mr. PELLEY. That is right, they were not required to pay anything.

The CHAIRMAN. In any of the plans?

Mr. PELLEY. In any of the plans that existed prior to the enactment of this law. It was all voluntary, all supplied by the railroad management.

Then, as you very well know, the men wanted a law giving them a pension and many of us couldn't quarrel very much with them about that. This was a voluntary thing and they could visualize that the railroad might get into such financial difficulty that they wouldn't be able to pay it. After they had worked all these years, it might be shut off. So as you gentlemen know very well, we agreed with them on a pension plan and we now have one under the law.

We also have an unemployment insurance plan, a law that was passed here that costs us about \$60,000,000 a year. This pension law costs us about \$60,000,000 a year—3 percent of, say, a \$2,000,000,000 pay roll. There is about \$120,000,000 in round figures that the railroads are being taxed each year for the benefit of their men.

In addition to that is the thing you mentioned, Senator. We made an agreement with the men, the so-called Washington Agreement, that covers men displaced by reason of an act of two or more railroads. If two railroads get together and consolidate a facility, those men are provided for under the Washington Agreement. There might be 8 or 10 railroads involved in it. That is a rather liberal arrangement. For instance, if a man is displaced by reason of a consolidation or coordination, under the Washington agreement if he has been in the service for 15 years, he will get 60 percent of his salary for 5 years, which certainly gives him a chance to adjust himself, and it may be that he can get employment elsewhere. The chances are that he can because the youngest men on the road are always displaced.

The CHAIRMAN. Now, the railroads are far ahead of other industries in this regard, are they not?

Mr. PELLEY. Some individual industries may have done as much. I would say generally, yes, Senator; and we feel this way about it, that while we regret as much as anybody could the necessity of displacing men, we are now doing for them about all, or maybe a little more than, the traffic will bear.

The CHAIRMAN. What is the necessity of displacing men? To what extent is that a problem?

Mr. PELLEY. Well, I don't know just how you want that answered.

The CHAIRMAN. You say you regret the necessity of displacing men. Now, obviously there is this problem of labor displacements.

Mr. PELLEY. Yes.

The CHAIRMAN. Otherwise, you wouldn't have made that Washington agreement. Now to what do you attribute this displacement? The combination of railroads or the substitution of one facility for more than one would have that result. Are there any other factors?

Mr. PELLEY. Well, of course, the railroads have built up a plant to handle probably twice as much business as they have got. I say twice as much; I don't think that is overstating it. They haven't got it, so they must pull in in every way they can, reduce their expenses in every possible way to meet the increased costs of operation we have had, the increased prices of material, and more taxes—this \$120,000,000; much of that is—

The CHAIRMAN (interposing). In other words, to maintain this plant which is double the capacity of the business that you get, it becomes necessary, in the effort to economize, to curtail the number of employees?

Mr. PELLEY. Well, the loss of revenue has brought that all about, but to answer you fully, there have been a great many instances where railroads could join together, use one facility and eliminate another.

Senator KING. Use the same roundhouse and machine shops.

Mr. PELLEY. Yes, and in that way you would eliminate some men. That is what I meant by coordination and consolidation of facilities. In one instance they abandon some service and the other railroad does the business for both railroads.

The CHAIRMAN. How about the improvement in locomotives?

Mr. PELLEY. We have had a tremendous improvement in locomotives which is all technological, as I pointed out.

The CHAIRMAN. And that has resulted in longer trains, and because of longer trains we have had these various bills to limit the number of cars to be hauled by one locomotive.

Mr. PELLEY. Well, that has had something to do with it, but it looks as if that has reached the limit and might be going down. We have speeded up our trains so much, and in many instances many freight trains are running like some passenger trains used to run. That long-train problem, I think, is probably on the wane. That has reached the peak in my opinion.

The CHAIRMAN. I wasn't talking about that. I was wondering whether this improved rolling stock, enabling you to use longer trains and faster trains, has had any effect upon employment.

Mr. PELLEY. Well, yes; it has.

The CHAIRMAN. It has reduced employment.

Mr. PELLEY. Oh, yes; and the construction of the locomotive itself, better material, better design, has eliminated a great deal of repair work, which has eliminated some men.

Senator KING. You have improved your tracks, too, with heavier rails so that has caused a great deal of expense, but in the long run it has cut down some of the expenses for maintenances.

Mr. PELLEY. Yes.

The CHAIRMAN. So that here is a definite case illustrating that technological advance has displaced human labor.

Mr. PELLEY. There isn't any doubt of it.

The CHAIRMAN. What is the mileage, the railroad mileage, today as compared with mileage in 1920?

Mr. PELLEY. Oh, I would say that we have abandoned probably 19,000 miles since then, 18,000 or 19,000 miles.

The CHAIRMAN. What percentage would that be of the total?

Mr. PELLEY. The maximum was a little over 250,000 miles.

The CHAIRMAN. The maximum reached when?

Mr. PELLEY. In 1920.

The CHAIRMAN. And to what extent has abandonment of line contributed to labor displacement?

Mr. PELLEY. Well, some, not a great deal. Of course it is always a branch line that never did employ very many men that has been abandoned. That hasn't made a very large difference.

Senator KING. Did the large railroads have much invested in the short-line railroads, rural railroads? They had so many in Illinois and Indiana. We have some in our State that have been abandoned as I understand. I was wondering if they were controlled or owned or operated to any extent by the railroads.

Mr. PELLEY. You don't mean the electric lines.

Senator KING. The electric lines.

Mr. PELLEY. Very little, perhaps the New Haven owned more than the rest put together.

Senator KING. Of course, there has been a great loss there.

Mr. PELLEY. I think the Southern Pacific has one electric line and outside of that I wouldn't know where to tell you to find any others except on the New Haven; they had a great many of them up there, in fact practically all of them.

The CHAIRMAN. Would I be correct in assuming that the railroads as a whole have more equipment now than they ever had?

Mr. PELLEY. No, sir; they have less.

The CHAIRMAN. How much less?

Mr. PELLEY. Dr. Parmelee will give you those exact figures, but we have about 700,000 fewer cars and a good many fewer engines.

Representative WILLIAMS. How much less carloadings and transportation business do you do, and passenger traffic, comparing 1937 with '20? During the loss, we will say, of a million men in the employment, how did the general business of the railroads compare?

Mr. PELLEY. The general business dropped down about 50 percent when it was at its lowest. It was cut just about in half.

Representative WILLIAMS. Let's take it in '37, if you have that, the late peak of employment.

Dr. ANDERSON. Much of the ground that is being covered by question and answer will be given in very considerable detail by Dr. Parmelee.

Representative WILLIAMS. I just wanted that general picture, if y

had it, with reference to the amount of business that was done during those years in comparison to the number of men who were employed.

Mr. PELLEY. You asked for a particular year?

Representative WILLIAMS. I asked at the peak and in '20 when you said there were 2,022,000 men employed and then in '37 when it dropped off practically 1,000,000.

Mr. PELLEY. You won't mind if Dr. Parmelee answers this. It happens that this chart starts with 1921.

Representative WILLIAMS. Well, the best you have.

Mr. PELLEY. I think your question is a better question, though, because business was better in 1920 than it was in 1921.

Dr. PARMELEE. Can we work this out and give it to you?

Representative WILLIAMS. Yes.

EFFORTS TO INCREASE BUSINESS

The CHAIRMAN. Let me ask just one more question, Mr. Pelley, and I will turn you over to Dr. Anderson. What has been the policy of the railroads toward increasing traffic upon the roads? What do you do to build up business?

Mr. PELLEY. Well, of course, first of all we solicit all we can, and then we make rate adjustments if it is necessary to get business or to retain business. If we see we are about to lose business to a competitor because of a rate situation we try to meet it.

Senator KING. But you have to go before the Interstate Commerce Commission to get the rate.

Mr. PELLEY. Yes; but I will say we don't have much trouble getting that; we don't have a great deal of trouble getting authority. Sometimes we do because they might think that it is not in the public interest to reduce the rate, but those are the two things that we can do. And, of course, we offer better service, we improve our service, and try to give any kind of service that will get the business.

Dr. ANDERSON. Do you find any difficulty, Mr. Pelley, in obtaining immediate reductions from the Interstate Commerce Commission?

Mr. PELLEY. Oh, I think probably I would have to say not a great deal. The Commission cooperates pretty well.

Dr. ANDERSON. So rate reduction as a procedure for attracting new business is the real way to go ahead?

Mr. PELLEY. You know there may be some cases where the Commission might feel that it is not in the public interest.

Senator KING. Frequently or occasionally applications are made; for instance, you get a market in the East for a strawberry crop or peach crop or some perishable crop and you can't keep it indefinitely (in my State we frequently get markets in the East for superior vegetables, and so on). By the time that you convert it, and you easily convert it because you want the traffic, and we get the Interstate Commerce Commission converted, the crop is wasted. I have in mind a peach crop. It is lost before you can get the rate which you are willing to give us carried into effect under the direction of the Interstate Commerce Commission. I ought to say, though, that they are very responsive and do all they can, but still you have that hurdle to cross whenever you want to cut a rate.

Mr. PELLEY. That is true, but I would say that they cooperate very well.

Representative REECE. Would you say, Mr. Pelley, that technological advancement is the major cause of the decline in railway employment?

Mr. PELLEY. No, sir.

Representative REECE. It is loss of business.

Mr. PELLEY. Loss of business.

Representative REECE. The railroads are the servants of business and not its masters.

Mr. PELLEY. Yes.

Representative REECE. There must be business before there is any major increase——

The CHAIRMAN (interposing). Loss of business may be attributed to some extent at least to unemployment, I suppose. All the factors that enter into a depreciation, that is the cause of loss of business.

EFFECT OF TECHNOLOGY ON EMPLOYMENT

Representative REECE. That has to do with the other phase of the question I was about to ask. How does the number of people employed in the transportation industry today compare with the number of people employed in the transportation industry in 1920 in relation to the amount of traffic moved?

Mr. PELLEY. I would say there are more employed in the whole transportation industry today than in 1920. I haven't that——

Representative REECE (interposing). I realize you are speaking in a general way.

The CHAIRMAN. Do you mean the whole transportation industry?

Representative REECE. Yes; in relationship to the amount of traffic being moved.

The CHAIRMAN. You weren't speaking of the railroads alone?

Representative REECE. That is right. I was including bus and water.

Mr. PELLEY. I would say, Congressman Reece, that there are more men employed in transportation today in relation to the tons moving than in 1920.

Representative REECE. Then, Mr. Pelley, how would you account for your statement that loss of employment is due to technological advancement?

Mr. PELLEY. Oh, it is; some of it, a great deal of it is.

Representative REECE. But when you take the transportation industry as a whole, is that true?

Mr. PELLEY. Well, the fact, Mr. Reece, that there might be more men employed in transportation as a whole, if you consider the character of the work done by these various agencies, and the way they do it, it wouldn't necessarily follow that none of our men have been displaced because of technological reasons. For instance, just visualize 5 men on a train; if you please, handling as many tons as probably 100 fellows on trucks would handle; you have to have a driver for every truck, and some of them have 2, one to relieve the other.

Representative REECE. Yes; and you would say the loss of your 5 men was due to technological development, that is motor truck, but on the other hand it resulted in the employment of 100 people in another phase of the transportation industry at the same time. The net result was an increase of employment in this particular instance.

Mr. PELLEY. Not because of technology. We just lost this business, that is the reason they put their men to work, and it takes more men to handle the same tonnage in trucking than on the railroads, so there would naturally be an increase in employment there.

Senator KING. The technological development to which you referred, which was included in your answer to the Congressman, referred to the waterways and to trucks.

Mr. PELLEY. I was confining my statement to the railroads only.

Mr. O'CONNELL. On that line, Mr. Pelley, my attention has been called to an exhibit that was introduced before this committee last week as Exhibit No. 2441,¹ and it refers to the volume of traffic on class I railroads in 1920 and in later years, and the volume of employment in the same years, and it might be interesting to note that on an index basis the volume of traffic in 1920 was 105.3, and in 1937, 84.9, about a 20-percent reduction. Now, if we take employment figures during the same year, we find employment in 1920, 118.4, and in 1937, 62, so that with the 20-percent reduction in volume of traffic you have a little more than 50 percent reduction in the volume of employment, and I take it that the difference would represent roughly at least the extent of technological change.

Mr. PELLEY. Well, and possibly deferred maintenance, but certainly a big fraction of that would be technological improvement.

Mr. O'CONNELL. I don't quite see how deferred maintenance would figure. Volume of traffic is physical volume of traffic and employment is wages.

Mr. PELLEY. Well, you have got all the costs there. Maintenance means—

Mr. O'CONNELL (interposing). It is all employment of course. I see; you mean you might have cut down on your maintenance force.

Mr. PELLEY. Mr. Williams, I believe that answers your question.

Representative WILLIAMS. Yes; largely. That is along the line of it.

Mr. PELLEY. Dr. Parmelee will give you that figure.

Mr. PIKE. I think it is true that in 1920 you were making up a lot of previous deferred maintenance that was deferred during the war, so that you had really an excess number of employees at that time on maintenance. That would be my memory. You were just coming out of Government hands?

Mr. PELLEY. Well, there was some maintenance deferred because it was difficult to get men to do it.

Mr. PIKE. Labor efficiency wasn't very high at that time.

Mr. PELLEY. It wasn't very high, and the plant had been pretty well used up.

Mr. PIKE. You had really deferred maintenance in there that you were trying to make up at that time as I remember.

Mr. PELLEY. I think that is right. In other words, you think, Mr. Pike, that this 2,000,000 men was somewhat inflated.

Mr. PIKE. That is what I mean, beyond normal for the technological status at that time.

Mr. PELLEY. No doubt about that; yes, sir.

Mr. HINRICHS. Did that stepping up of activity to overcome the old plant concentrate in 1920 or did it begin more particularly in 1923—1922, or '23?

¹ See appendix, p. 17310.

Mr. PELLEY. It started in 1920 with reference to maintenance, but in 1923 the railroads entered into a plan to fix it so there never would be any more railroad shortage of transportation in this country. They bought a great deal of equipment and they built larger and better terminals and improved the equipment and the general line situation a great deal, and spent about \$7,000,000,000 in doing it, so the real campaign started, as you suggest, in '23.

Senator KING. So the railroads had run down a little bit during the war.

Mr. PELLEY. Well, they were pretty severely used, Senator King, during the war; yes.

Senator KING. You had to employ in many instances, or did employ in many instances, persons who had not been skilled in labor. You employed young men, and older men and women in some of your activities.

Mr. PELLEY. That is right.

Dr. ANDERSON. Your thesis is, Mr. Pelley, as I get it from this statement that the railroads of America are a dynamic industry.

Mr. PELLEY. That is right.

Dr. ANDERSON. That being dynamic they can take advantage of any chance there is to go ahead in terms of increased volume of business, increased employment, better times leading to prosperity in that industry generally.

Mr. PELLEY. That is right.

Dr. ANDERSON. And you point out in the beginning of your statement an example of it.¹ You say that after the trough of '32-'33, you need point only to the year 1937 as an illustration of what you have in mind.

Mr. PELLEY. That is right.

EFFECT OF INCREASED BUSINESS ON EMPLOYMENT

Dr. ANDERSON. I would like to read you some figures from Mr. Parmelee's own compilation in order to bring out a point that may be of crucial significance to this discussion of technology. I am taking data directly from his compilation that he will present to us this afternoon, in comparing 1933 with 1937. I took total mileage operated, total tracks rather than that first figure given, and it showed in comparing '33 with '37, now, decline of about 3 percent.² Freight ton-miles shows an increase, and this does show the dynamic quality of your industry, from the trough in '32-'33, or '33 here, to '37, of 45 percent.³ Passenger-miles showed an even greater increase, or 51 percent.⁴ The number of employees used, however—and this I take it is average number of workers engaged in the industry, it doesn't talk about full-time employment—increased only 15 percent.⁵ That is, the volume of freight ton-miles and passenger-miles increased 45 or 50 percent. The number of employees increased, however, only 15 percent. The total hours worked increased somewhat better, considerably better, 25 percent.⁶ The total compensa-

¹ See p. 16518.

² See "Exhibit No. 2491," appendix, p. 17350.

³ See "Exhibit No. 2501," appendix, pp. 16570, 17355.

⁴ See "Exhibit No. 2502," appendix, p. 17469.

⁵ See "Exhibit No. 2517," appendix, pp. 16582, 17362.

⁶ Ibid.

tion paid almost kept pace with the freight- and passenger-mile increases, namely, 41 percent, but your unit cost of operation actually declined with this 45-percent increase in freight ton-miles. There was a decline of 1 percent in unit cost of freight operation, and an increase of only 6 percent in passenger unit costs.¹ Now, the question I would like to ask, if these figures are correct, is, Is it likely, even with an upswing of business of such proportions as indicated by these figures, from '33 to '37, that this is the characteristic trend with respect to employment, that employment will not be comparably increased with the volume increase of business of the railroads?

Mr. PELLEY. I think that is a fair deduction. You understand that unless business is very heavy, some more business can be taken on with very little cost. That is, you have got an organization set up to handle a certain volume of business that fluctuates, so therefore, if you take some more business, you can handle it at very little added cost, and with very little need for more men up to a certain point.

Trains run full. You have got a certain fixed number of employees you can't dispose of, even though your business may be at very low ebb, and when the business comes on you don't add employees to that particular switching yard, or whatever it may be. There are just many fixed men around whose number doesn't fluctuate, so therefore, when your business increases, you can handle it without adding a great many more men. It does not always follow that if you have a 10-percent increase in business you are going to have a 10-percent increase in employment, because many of your men are fixed, and they are there to handle big business or little business, and their expense does not fluctuate at all.

Dr. ANDERSON. So that if we thought in terms of a much expanded railroad industry, in terms of volume of freight- and passenger-miles, and volume of business, we must be very careful, must we not, not to assume immediately that this dissipates the whole problem of unemployment in railroads?

Mr. PELLEY. That is right.

Dr. KREPS. I should like to continue the line of reasoning that Mr. Pelley was following a moment ago. I recollect that in the hearings on the Works Financing Act of 1939, Mr. Pelley testified that even in 1937 there was a capacity to take care of 25 percent more traffic than was being taken care of at that time.

Mr. PELLEY. What time is this?

Dr. KREPS. In 1937. He said in his statement that—

'We could take on about 25 percent more business than we now have with this equipment that is now ready, and by repairing different cars we probably could handle more business than we are handling now.

That is on page 72 of this print.

Pursuing Dr. Anderson's line of questioning, it would take something in excess of 25-percent increase in the railroad traffic over 1937 before you would begin to get proportional additional employment to traffic; is that correct?

Mr. PELLEY. I wouldn't say that far; I would not say 25 percent more. You see, you are going to have some added employment immediately; you are going to run more trains, you are going to employ more men to run them.

¹ See "Exhibit No. 2518," appendix, pp. 10586, 17362.

Dr. KREPS. I am still correct, am I not, that according to your own figures and estimates that you were operating even in 1937 at something like 75 percent of capacity?

Mr. PELLEY. Oh, yes.

Dr. KREPS. Therefore, there could have been a considerable expansion in volume of traffic over 1937 without much increase in additional employment. As you have testified to Dr. Anderson just a moment ago, the increase from 1933 to 1937 did not result in corresponding increase in employment because you had the capacity already there, and you had to have men in 1933 to keep the plant in a stand-by condition. I am trying to get, you see, an estimate of the amount of increase in railroad traffic that would be necessary, (a) before we would get more additional employment, more than a proportional increase in employment, and (b) before we would get any substantial increase in employment.

Mr. PELLEY. Now, any sizable increase would bring some additional employment.

Dr. KREPS. But not proportionally?

Mr. PELLEY. No; I wouldn't think so.

Mr. O'CONNELL. May I ask this question right there, Mr. Pelley? During the same hearing to which Dr. Kreps has referred there was some discussion with regard to the existing plant of railroad companies, particularly rolling stock, as to whether it was in good shape or whether there was need of replacement.

Mr. PELLEY. What hearing is that?

Mr. O'CONNELL. The works-financing bill of last year, before the Senate Banking and Currency Committee. You testified and Mr. Eastman testified. There was some extensive discussion about just how obsolete, or how much need of replacement there was in the rolling stock of the various railroads. A little earlier you indicated that the physical plant of the railroads was in general in much better condition than is popularly supposed. It seemed to me in that same hearing that there was some testimony to the effect that rolling stock was relatively old, from which I would derive two things: that a substantial amount of it was in need of replacement, and that the operation of the equipment now being used probably results in a higher maintenance cost than were the equipment replaced.

Mr. PELLEY. Yes. I think the latter is particularly true.

Dr. ANDERSON. Mr. Pelley, I wanted to pursue this point from the standpoint of a downward swing in the volume of business and see what the effect is upon the labor force employed.

I did the same thing, took Mr. Parmelee's figures and made a comparison now, between '29 and '39. Freight ton-miles were reduced 25 percent;¹ passenger ton-miles, 27 percent;² number of employees employed in that reduced business, 41 percent;³ and unit cost of freight operations, 9 percent; and passenger operations, 15 percent.⁴

Now, it would appear from these figures that either on the upswing or downswing of railroad business, labor fares badly. Just as you pointed out that on the upswing of business there is considerable likelihood that labor will not share proportionately in increased business,

¹ See "Exhibit No. 2501," appendix, p. 17355.

² See "Exhibit No. 2502," appendix, p. 17355.

³ See "Exhibit No. 2517," appendix, p. 17361.

⁴ See "Exhibit No. 2518," appendix, p. 17362.

so on the downswing labor is displaced more rapidly than the volume of business drops. Would you explain that?

Mr. PELLEY. Well, of course, when the business goes down, the railroads have got to put the expenses down with the business, and with the wage bill being 60 percent of total expenses on a railroad, it is just impossible to reduce expenses a great deal without touching the men. You have got to reduce your employees, that is all. Some of it is better methods—you find cheaper ways of doing things—and some of it, of course, is simply deferred work.

You see, you couldn't do much with your expenses on the railroad unless you get into the men; it is unfortunate, but it is true, because some 60 percent of all of our expenses are the men.

Dr. ANDERSON. Now, that leads to a question of great concern, it seems to me, from the standpoint of this problem and the railroads' dilemma.

On page 16519, you make the contrast between problems of the railroads in the past, when the big problem, I take it, the principal stimulus to technological progress in the early days was the urgent need for more mileage, equipment, and more men to operate the plan. That was during the days when you were developing the transportation system of the Nation?

Mr. PELLEY. That is right.

Dr. ANDERSON. Would you say the transportation system of the Nation, overall, in the gross is adequate at the present time? I am thinking now in terms of mileage of track, of facilities available for anything like a reasonable increase in business over present business.

Mr. PELLEY. Yes.

Dr. ANDERSON. Then you say, "In more recent years, the problem has changed from one of rapid physical expansion to one of intensive struggle against depression, and against growing competition." We developed that thought a while ago. In this new problem, is it true that since labor is such a large proportion of the total cost, and the railroads are forced to face intensive price competition, railroad labor is likely to be more adversely affected than it was formerly by changes?

Mr. PELLEY. Well, I don't know that I would say "more adversely," because in the past 10 years, the railroads have had to do everything they could do to reduce their number of employees and therefore reduce their expenses.

Now, it will probably be just as severe in the future as it has been in the last 8 or 10 years, but I doubt if it would be more so.

DISTRIBUTION OF RAILWAY EARNINGS

Dr. ANDERSON. I wanted to get your judgment on one other point, Mr. Pelley. This new book of the Brookings Institution treats of railroads in several instances. I read this statement from page 35 of Spurgeon Bell's book *Productivity, Wages, and National Income*:

Wages declined as a percentage of total income in contrast to salaries and earnings to capital. The relative trends of the several shares as percentages of total income in years of comparable prosperity are indicated in the table which follows:

It will be seen that wages as a percentage of income declined materially in the 20's. The percentage in '36-'37 was appreciably below that of the early '20's; salary as a percentage of income declined somewhat in the '20's, but rose

in the '30's to a figure above that of the early '20's. Earnings on capital in relation to the total income increased markedly in the '20's, and then declined sharply in the '30's. In '36-'37 the percentage was, however, above that of '23-'24.

I realize that hurried reading of that kind makes it difficult for you to follow, but the point made is that wages declined as a percentage of total income in contrast to salaries and earnings of capital.

Mr. PELLEY. In what period?

Dr. ANDERSON. The twenties and the thirties are being compared. Does that seem to you to be a fair statement of the situation? It is true that in these two periods under review, wage earners' income did not follow the same course as salaried workers' income, in relation to total earnings? In other words, did salaried workers profit more by the conditions that are now operative than wage earners?

Mr. PELLEY. I had not thought that that was true in the twenties. I don't question it, but I had not thought that that was so. I thought the wage earners kept up pretty well.

Dr. ANDERSON. Do wage earners and salaried workers in the railroads industry receive the same treatment with respect to these problems of employment and unemployment, that you have been indicating earlier, such as retirement and other privileges?

Mr. PELLEY. Oh, yes.

Dr. ANDERSON. There is no difference?

Mr. PELLEY. No. Now, that wouldn't apply at all times to the salaried officers, but pretty generally, it does.

Dr. ANDERSON. Well, is it true that in the period of declining employment they are affected equally? Put it this way: is the salaried labor force more stable than the wage-earning labor force, or less so?

Mr. PELLEY. Probably, yes; a little more stable. I should think so.

Mr. O'CONNELL. I have one collateral question that relates to what you had to say earlier in your testimony about the degree to which competing methods of transportation have been subsidized in one way or another. Are you familiar with the report of Mr. Eastman's committee which is referred to in the morning press as just having been released on that same subject? ¹

Mr. PELLEY. I have not seen the finished report. I have had more or less information about it from time to time, as the report was being made. But I really haven't seen the finished report, and don't know exactly what it says.

Mr. O'CONNELL. The news report or article indicated it had been widely circulated in draft form to the various interested people. I thought you might have seen it.

Mr. PELLEY. I have seen the draft of it sometime back. In fact, 2 or 3 years ago when the first draft came out. But I don't know how the finished product looks.

Mr. O'CONNELL. Unless it is wrongly reported, it seemed to me that the report comes to a somewhat contrary conclusion from that reached in the statement. I don't think we can discuss it, but I thought the existence of the report ought to appear in the record, and as I understand it, it comes to a somewhat different conclusion than you do.

¹ Joseph Eastman, *Public Aids to Transportation*, Government Printing Office, Washington, 1940.

Mr. PELLEY. If the final report is anything like the draft I once saw, then it differs a great deal from my view.

Dr. ANDERSON. Mr. Pelley, we referred earlier in the hearings to the period of '21-'22, when the railroad industry was taking back its enterprise and beginning to operate again after a period of Government operation. This same Brookings treatise argues that at that time unionization had flourished, under Government encouragement, to a point where labor would be able to maintain the gains realized during the period of Government control. Then this statement follows, which I would like very much to have you comment on:

This rise in the wages of labor had a stimulating effect on the development of labor-saving devices and the improvement of labor management so that labor costs might be brought more into accord with wage costs prevailing before the Government secured control of the railroads.

Mr. PELLEY. I think that is a fair statement.

Dr. ANDERSON. And that is exactly what occurred, was it?

Mr. PELLEY. I think so, yes, sir; I would say that is a correct statement.

Dr. ANDERSON. Would you say that it is generally true that when wage rates are moved upward by some agreement in the railroad industry, railroad management makes every effort to nullify the effect on total cost by technological improvements?

Mr. PELLEY. Yes, sir; I think any other answer would be less than frank. I think they do.

Mr. PIKE. You wouldn't just narrow that down to railroads?

Mr. PELLEY. Well, I wouldn't care to comment on industries that I do not know much about, but I know that that is true of the industry that I have spent my life in.

Mr. HINRICHS. In that connection, Mr. Pelley, even under conditions of stable wages, isn't the railroad industry making continuous efforts to decrease labor costs?

Mr. PELLEY. Yes, sir.

Mr. HINRICHS. In your judgment does that situation change very sharply at a time when a wage increase is granted?

Mr. PELLEY. Well, I don't know that I would say very sharply, but it changes, there isn't any doubt about it.

Mr. HINRICHS. Can you illustrate it concretely, because it is at variance with some of the experience that we have found in other industries, some of the heavy manufacturing industries, for example. Can you illustrate out of the railroad experience where this time relationship between a wage increase and increased efficiency of labor has been demonstrated?

Mr. PELLEY. No; I couldn't, but certainly it stimulates management to look about to see what they can do in the way of reducing the number of employees to meet as much of that increase as they can, and it at least brings them to a very careful looking over; they are looking all the time for reductions in expenses, but it certainly at least brings on a special campaign to reduce the number of employees as much as possible to offset the increase in wages. I think that is about as much as I can say about that.

EFFECT OF DISPLACEMENT ON AVERAGE AGE OF WORKERS

Mr. HINRICHS. While I have interrupted, may I ask another question? When displacement occurs on the railroads, it is not the older worker on the railroad that is affected, but the younger. Is that correct?

Mr. PELLEY. That is correct.

Mr. HINRICHS. So the complaint which we have heard frequently with reference to other industries as to the peculiar disadvantages of technological displacement to the older worker would not be true of railroads?

Mr. PELLEY. No, sir.

Mr. HINRICHS. That is a provision of your various collective agreements, is it not, and has been developed by the railroads in conjunction with the unions?

Mr. PELLEY. That is correct.

Mr. HINRICHS. That situation holds for the transportation workers. Does it hold in the shops in the same way?

Mr. PELLEY. Yes, sir.

Mr. HINRICHS. How about maintenance of way?

Mr. PELLEY. The same way.

Mr. HINRICHS. It holds true throughout the entire realm of railroad work?

Mr. PELLEY. Yes, sir; if the man is qualified to do the work, the senior man gets it. I don't know of anybody who was ever disqualified.

Dr. ANDERSON. Mr. Pelley, do you think that is an impediment to efficient operation or not?

Mr. PELLEY. Well, sometimes that is questioned, but we feel that it is right, and if it does bring about some deficiencies here and there, we feel that we ought to absorb them.

Dr. ANDERSON. In other words, in your industry management has some regard for ethics in this respect. By "right" you mean moral right?

Mr. PELLEY. We think it is fair treatment to the men to give the senior men the work, and otherwise we have generally felt the seniority rule was the men's rule, and we think it is fair. We are criticized sometimes because probably we have some of our older men on passenger trains or meeting the public. Some of our patrons might prefer to see some snappy young man in the job, and we get a little criticism of that kind, but not much. We feel that the traveling public generally are very much in sympathy with these older men having the jobs because they have had much experience, and they know that they are efficient, sober men and that they are in good hands when they get on trains manned by men of that type. We just think it is right; we agree with the men 100 percent on the seniority rule. We offer no objections to it at all. In fact we are for it.

The CHAIRMAN. Have you finished with Mr. Pelley?

Dr. ANDERSON. Mr. Pelley has kindly consented to come back this afternoon and be with Mr. Parmelee to answer any questions that might arise in the discussions that will follow the presentation of Mr. Parmelee's figures.

The CHAIRMAN. Mr. O'Connell referred awhile ago to the report of Mr. Eastman. Of course, I think that that deals with a little differ-

ent subject from what we are handling here, namely, technological improvement and labor, but it occurs to me to suggest, Mr. Pelley, that perhaps in the interim between now and this afternoon you might care to look at some of the press reports on Mr. Eastman's four-volume study which apparently has just been made public, because he deals with this whole question of public aids to transportation, including highway transportation, waterway transportation, and air transportation, and apparently he makes an attempt to evaluate the total amount of public aid to the railroads from the period of construction down to more recent aids by way of R. F. C. and P. W. A. Likewise, he attempts to evaluate the Government aids to waterways in construction of the waterways, and to the air lines in various subsidies, mail contracts, and the like, which have been extended to them. Whether it would be appropriate to go into the matter I do not know, but since we opened it this morning perhaps somebody may want to ask you some questions this afternoon, although it may be more desirable to keep our attention upon the question of employment and technological advance.

Mr. PELLEY. I will be very glad to answer any questions I can. I will have a look at it. I have seen the draft, Senator, some time back, but I have not seen the finished report.

The CHAIRMAN. Of course, to me the significant thing about it is this. I don't want to go into any attempt to analyze the correctness or lack of accuracy in this report or any other report, but it is significant that throughout the history of the Government, ever since the Constitution was drafted and the First Congress sat, we have been appropriating public money for the aid of business of one kind or another. Congress has never ceased appropriating money to stimulate business since it first began to appropriate for rivers and harbors. When the railroads came they constituted a technological advance that put the canal companies out of business. Of course, now the railroads are having their little troubles with waterway and highway transportation again. But the whole problem, so far as those of us sitting on this side of the table see it, is how the Government may aid all forms of business and what adjustments of one to the other can be made so as best to provide full employment for the masses of the people now living, and living each year.

Mr. PELLEY. That is right.

The CHAIRMAN. The committee will stand in recess until 2:15.

(Whereupon, at 12:25 p. m., the committee recessed until 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing resumed at 2:20 o'clock, Senator O'Mahoney, the chairman, presiding.

Dr. ANDERSON. Mr. Pelley is with us for an answer to a question you asked him just prior to the luncheon hour.

Mr. PELLEY. Mr. Chairman, that was quite an assignment you gave me during the lunch period, but I want to say that I had seen a draft of this report, and it seems the final report is somewhat similar to the draft. They find some rather astonishing things. The first is that they take the position that governments of all kinds ought to pay 60 percent of the cost of maintaining highways and that the users

of the highway ought to pay only 40 percent, and with that assumption they find that the highways are not subsidized. They call it aid. I call it what it is, subsidy. And that is the basis on which they conclude that the users of the highways are really paying a little bit more than they ought to pay.

We don't agree with that at all. When I say "we" I don't mean the railroads necessarily.

I think I ought to tell you this, that when this draft came out we had a look at it and we employed three very outstanding highway engineers in this country, no one of whom ever earned a penny from a railroad: Dr. Breed, who is the head of engineering of M. I. T., supposed to be one of the best technical schools in the world; Mr. Downs, who is a highway engineer in West Virginia; and Mr. Clifford Older, of Illinois, the father of slab highway construction, one of the most eminent highway engineers in the world. And they wholly disagreed with that. They say that the users of the highway ought to pay about 75 percent instead of 40, and that Government ought to pay about 25 percent.

You can see what a wide difference that would make. This first draft that I saw covered a period of some 11 years. I didn't have the time to check just what years they were, but they were the last 11 years for which figures were available at the time this study was started.

The CHAIRMAN. I suppose it may be said that the users of the railroads pay the entire cost of the railroads.

Mr. PELLEY. That is right.

The CHAIRMAN. And all of the construction charges of the railroads are assessed against that revenue?

Mr. PELLEY. That is right; yes.

The CHAIRMAN. But, of course, it is true that through the years, Government has aided and even subsidized the railroads in their construction program.

Mr. PELLEY. Yes. I say "yes"; I mean no. I will tell you about that just a little later.

The CHAIRMAN. I know your point of view, Mr. Pelley.

Mr. PELLEY. If you want me to—

The CHAIRMAN (interposing). I was going to lead up to this: I realize, of course, that the Government in consideration for that may have been able to obtain a lower freight rate on certain shipments.

Mr. PELLEY. That is right; yes.

The CHAIRMAN. And that is a substantial item and has been through the years. Whether or not that is covered by Mr. Eastman's report, I don't know, but on the other hand, the increased traffic which comes about as a result of the development of highways inures to the benefit of the railroads, at least to some extent—how great an extent, I don't know. That is true, isn't it?

Mr. PELLEY. Oh, yes; it makes a lot of business for the railroads in raw materials that go into the manufacture of automobiles, the finished product itself. Oh, yes; it has made a great deal of—

The CHAIRMAN (interposing). I observed from the report of Mr. Eastman's study this morning that reference was made also to R. F. C. and P. W. A. contributions. What the analysis of those was, I don't remember. But the sum total, as I recall from the newspaper

account was that Government has contributed about \$1,433,000,000 to the railroads in one way or another.

Now, what there is to offset that, of course, I don't know, because I have not read the report.

Mr. PELLEY. I think the railroads got \$1,449,000,000. It is very interesting to analyze his figures, however, when you analyze it and take out of it what ought to be taken out of it, why, it is an entirely different figure altogether.

Now, to get along with this highway thing, I wanted to finish this statement to show you just how far apart we are. In that 11-year period I mentioned, Mr. Eastman's report indicated—and I think the figures are correct, so far as I know—that about \$19,000,000,000 had been spent on highway construction and maintenance during that period.

Well, he said that the users of the highway had paid \$124,000,000 too much; the final report changes that a little. These 3 experts that we employed—and I repeat, no one of them has any interest in the railroads—said that the users of the highways had paid about \$9,750,000,000 too little, so if you would add \$9,750,000,000 to \$124,000,000, you see how far apart these people are, and that only emphasizes the importance of finding out what the real facts are by some authoritative body that is absolutely disinterested except to get the facts, and let the people know what the facts are.

Now, Mr. Eastman says that these large trucks are paying too much, and he gives a scale of how much too much they are paying. As I said to you this morning, only two States have ever made a real study of it, and it was made by the highway departments of those States, Illinois and Missouri. In Illinois they found that these larger trucks were subsidized to the extent of \$966 per truck per year, and in Missouri—and I am sorry Mr. Williams is not here to hear this—they run up to about \$650 per truck per year. The sum total of what I am saying is that this report on highway subsidies doesn't seem to be of very much value.

Mr. PIKE. There is certainly a very wide difference of opinion.

Mr. PELLEY. Of course you see what brings about that wide difference is that these people say that the State ought to furnish 60 percent of the highway, whereas these other people who made this study for us say that they ought to furnish 25 percent.

Mr. PIKE. Of course, you could never get together on a set of facts as long as you started your premises so far apart.

Mr. PELLEY. That is true.

The CHAIRMAN. As I read this story, if I may interrupt, it apparently is just a preliminary to another study.

Mr. PELLEY. I should think so. It couldn't be more than that.

The CHAIRMAN. Because it appears that Mr. Eastman has recommended in this report that a three-man board should be set up by the President to investigate the whole problem of inequities in public contributions to the various transportation agencies revealed by the newly published data.

Mr. PELLEY. I think that is very sound.

The CHAIRMAN. That opens up the whole field and it is probably outside of the scope of the T. N. E. C.

Mr. PELLEY. That is a very sound recommendation.

Mr. O'CONNELL. Mr. Chairman, I apparently precipitated this discussion, and it does take us pretty far afield. I should just like to say that my only reason for mentioning the report was that in Mr. Pelley's statement he was somewhat dogmatic to the effect that other means of transportation were in fact being subsidized to the disadvantage of the railroads, and it occurred to me that the record ought to show at least that there is a very wide difference of opinion between interested people on that particular point. I am perfectly willing to concede that this is not the place for us to discuss the merits of the two positions, but I think it should be noted that there are two positions.

Mr. PELLEY. That is all right. It is pretty generally known that there are two positions, and of course we don't agree at all on this railroad subsidy. I could prove it to you here and now that the Government has made more money out of advancing these so-called subsidies to the railroads than we have, and they have been making about \$7,500,000 a year out of it.

The CHAIRMAN. Thank you very much.

(The witness, Mr. Pelley, was excused.)

Dr. ANDERSON. Mr. Chairman, the second witness for railroad management today is Dr. J. H. Parmelee of the Association of American Railroads. Mr. Parmelee is presenting to you the basic material that is so important in judging this problem, and he is doing so in a booklet that he has prepared for the committee, which we should like to have introduced. We have made exhibit numbers for each one of the displays in the book.

The CHAIRMAN. Then as the witness proceeds with his discussion, if at the appropriate time you will suggest a number——

Dr. ANDERSON (interposing). I think we have given them numbers.

The CHAIRMAN. You want these exhibits to be introduced as he explains it.

Dr. ANDERSON. That is right. This is done so that we will have them in the record. I did want to say by way of compliment to Dr. Parmelee that it is an unusually able, comprehensive statement of the situation. I have never seen so compact an array of data discussing the various ramifications of the railroad problem, and I personally want to thank him for having spent the time on getting such material together for our use.

The CHAIRMAN. Do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth and nothing but the truth, so help you God?

Dr. PARMELEE. I do.

TESTIMONY OF J. H. PARMELEE, DIRECTOR, BUREAU OF RAILWAY ECONOMICS, ASSOCIATION OF AMERICAN RAILROADS, WASHINGTON, D. C.

Dr. PARMELEE. My name is J. H. Parmelee. I am the director of the Bureau of Railway Economics, and have been director of that bureau since 1920, the bureau being one of the units or departments of the Association of American Railroads.

As Mr. Anderson has stated, the bulk of my statement to the committee this afternoon——

The CHAIRMAN (interposing). May I interrupt to ask you what your functions are as director of the Bureau of Railroad Economics?

Dr. PARMELEE. I think our bureau, Mr. Chairman, could be described as the economic and statistical headquarters or clearinghouse of the steam railroads of the United States.

The CHAIRMAN. Maintained by the railroads?

Dr. PARMELEE. Maintained by the railroads as a division of their national trade association. The slogan, if you call it that, or the instructions which the bureau has from the railways which maintain it, are to make as far as we can do so a completely scientific study of transportation problems.

CHARACTER OF THE RAILROAD INDUSTRY

Dr. PARMELEE. My statement to the committee will be largely an explanation, with some analysis, of this booklet to which Dr. Anderson has referred. Before I enter upon that analysis, however, may I make one or two general statements about the railway industry as a sort of background for the presentation of this material? I do not need to call the attention of the committee to the fact that the steam railway industry in the United States is the only Nation-wide carrier of general commodities. It has a Nation-wide network over the whole country; it serves all the cities and all the States and a great portion of the smaller cities and towns, and it enters into 96 percent of all the counties of all the States of the Union. It is the one indispensable carrier of freight serving every day regardless of weather conditions, climatic conditions or otherwise; and it is always called upon with unusual emphasis at times of emergency, in times of flood and other natural catastrophe or in times of national, political, or social emergency.

Despite the rather heavy competition with which the railroad industry has been confronted in recent years, it still handles more than 60 percent of the total commercial freight traffic of the United States and more than 50 percent of the total commercial passenger traffic of the United States. In addition to being the outstanding commercial traffic agency of the United States, it is, as has been pointed out to the committee, already a large employer of labor, having 1,000,000 or more men in its employ at the present time; it is a large purchaser of the commodities produced by other industries. For example, it purchases some 25 percent of the total coal produced in this country. It produces and uses some 20 percent of the total steel and iron products of the United States. It utilizes 60 percent of the steel-rail output, which is, of course, to be expected.

It utilizes some 20 percent of the total timber cut in this country, and it utilizes smaller proportions of a large number of other commodities, cement, and other items that are used in operation or in construction.

It has been estimated that for every man employed directly by the railroads through their purchases of supplies they furnish employment indirectly to at least one other man. In other words, that for the million men who are employed by the railways there are probably at least another million men whose employment indirectly depends upon the purchases made by the railways.

The railway industry in addition is a large taxpayer. Its taxes last year amounted to about \$1,000,000 a day, or \$365,000,000, and all of those taxes, as has been pointed out to the committee, go directly for governmental purposes. In other words, none of it goes back to the railroads for the purpose of maintaining their own highways, the highways over which they operate.

There are some differences, however, between the railway industry and other industries. Some of these have already been mentioned in your previous discussion, and I can mention them, I think, rather briefly and pass on. The railroad industry is one of the most completely coordinated industries in the United States. Although several hundred different units, corporations, operate the railways, all having a separate legal identity, they do operate more or less as a common system. This comes about through the fact that they have a standard gauge of track, they have completely interchangeable locomotives and cars, not only as to the complete units of equipment but also as to the various accessories, two of the most important of which are the standard coupler and the standard air brake, which are interchangeable on all cars; and finally they have an arrangement by which freight cars travel, regardless of their ownership, over the lines of all railways freely from one end of the country to the other. Under the arrangements laid down by the Interstate Commerce Commission, they operate on joint rates and routes so that freight and passengers can be shipped or travel from almost any one point in the United States to almost any other point on a joint rate.

For these reasons the railway industry can be looked upon in a certain sense as a coordinated industry, working as a common unit for a common end.

Again, the railway industry is a service industry. That fact was also mentioned this morning. Being a service industry it may not produce its product and store it in advance, as many other industries may. It produces its product, which is the service of transportation only, as and when demanded. One result of that situation is that the railway industry may not build up a surplus of product over a given period, perhaps employing labor for that purpose, and then close down or relax its efforts during a period of slight demand, but it must continue to operate, regardless of the demand, 24 hours of the day, 52 weeks in the year.

It must always be ready to serve any demand which may be made upon it.

Again, the railway industry is, as has been stated, a strictly regulated industry, probably more so than any other single industry in the United States. That leads, among other things, to a certain amount of reduction in managerial discretion, and also to a certain inflexibility in its rate structure, which is its price structure, which makes it difficult to pass certain added costs on to the public.

Finally, the railroad industry has been and is confronted with this very perplexing problem of competition, to which the committee has already given considerable attention, and I need not dwell on that point further.

Now the railway industry of this country is classified by the Interstate Commerce Commission into two general groups—what the Commission calls line-haul railways, which operate between terminals, and

the so-called switching and terminal companies, the latter being what may be considered to be the small links in the large network to which I have referred. They do the switching work in and around terminals, they are the connecting links between railroads in terminals, and to some extent they operate bridges and ferries. In the general statistics which the Interstate Commerce Commission uses, switching and terminal companies are seldom included, not because they are not an important part of the railroad system, but because the very nature of their work makes it difficult to secure comparable statistics to those of the line-haul railways.

Attention is usually devoted to the line-haul railways, the second large group, those which operate between terminals.

Now, there are in this country a total of 896 operating railway companies as reported by the Interstate Commerce Commission, of which 244 are switching and terminal companies. Deducting that figure from the total, we have a remainder of 652 line-haul companies. However, of those 652 companies, only 136 are classified as class I companies; that is, companies whose annual revenues are in excess of \$1,000,000 per year each. They are sometimes known as million-dollar railways.

The CHAIRMAN. How many of them?

Dr. PARMELEE. One hundred thirty-six, Mr. Chairman, and those companies operate 94 percent of the total line-haul mileage and take in 97 percent of the total line-haul revenue. So that while they are less than one-fourth in number they are from 94 to 97 percent in terms of traffic and mileage importance.

The CHAIRMAN. Is there any interrelationship among them?

Dr. PARMELEE. Control, you mean? Yes; in some cases there are companies which have 50 percent, or more or less, interest in other companies.

The CHAIRMAN. Have you made any study or calculation which would enable you to say how many groups there were in terms of control among the 136?

Dr. PARMELEE. No; I have not in just that way. The Interstate Commerce Commission publishes each year a list of all the railway companies in the United States and does just what you suggest. That is to say, where there is any common relationship between railroads they put them all in one group and indicate exactly what is the nature and extent of the relationship between them.

Dr. ANDERSON. Mr. Parmelee, do you remember the last figures from the Interstate Commerce Commission? Out of those 136 roads, how many independent class I roads would we have, considering affiliations?

Dr. PARMELEE. I don't believe that I could answer that question specifically. I would say, however, that the number would not be greatly reduced. There are some affiliations among the larger companies. There are more affiliations, however, in the sense that some of the larger companies control some of the smaller ones, and in that way have created what we consider to be a railway system.

Dr. ANDERSON. Is the trend in the direction of further concentration, through control either of other class I controlling affiliates or of class II railroads? Is there a trend?

Dr. PARMELEE. I would say the trend is not very marked at the present time, largely because of the consolidation provisions in the

Transportation Act of 1920, and partly because of the depression during the past 10 years.

Mr. PIKE. Things are in reverse really at the moment, aren't they, Mr. Parmelee, with some of the 1920 purchasers turning out to be no control at all, Missouri Pacific, Erie, the New Haven, to some extent? Those common shares are either going to disappear or represent such a small amount of control that the control is going back to the public.

Dr. PARMELEE. To the extent that the stock is being wiped out as it is in a number of these reorganizations.

Mr. PIKE. Two of those organizations will be wiped out entirely, and the third one—

Dr. ANDERSON (interposing). What you are saying is, isn't it, Mr. Parmelee, that the reason for the failure of the trend toward concentration is that certain legal enactments and other noneconomic artificialities are preventing it?

Dr. PARMELEE. I don't like to put it in quite that language. It is a fact that the Interstate Commerce Commission has for a number of years recommended to Congress that the consolidation provisions of the Transportation Act be repealed, at least that part of those provisions which set up the general plan. The economic depression of the past 10 years has done these two things which have been mentioned: It has slowed down for obvious reasons any desire to build up larger systems, and it has, as Mr. Pike indicates, or is having, at least, a trend toward wiping out the present common, and in many cases even the preferred, stockholder.

Now, with that brief introduction, Mr. Chairman, may I turn to this statement which is before you?

The CHAIRMAN. Now, your introduction has had to do principally, however, with the general phases of the railroad industry, the general problem, hasn't it?

Dr. PARMELEE. I was trying to give you a very brief picture of the industry as we have it spread before us, Mr. Chairman; yes.

The CHAIRMAN. Now, before you begin to comment upon your various tables and exhibits, would you care to make any general statement about the relationship of the technological advance of the railroad industry and the problem of employment?

Dr. PARMELEE. May I answer you this way, Mr. Chairman? I was about to say in introducing this statement, that one of the things that I think it will show the committee, and I think it speaks eloquently on that subject, is that there has been over a period of years a very marked advance in technology.

After I get through with the statement, I was going to turn, if I may, to some of the specific things which have been done in the railroad industry which have brought these technological advances about, not going into detail, of course, for that would be out of the question. Time would not permit, and I am not a technical expert, but I was hoping that after that had been shown to the committee, if there were any questions as to some of these more general matters, we might discuss them at that time.

Mr. O'CONNELL. May I ask two questions with reference to your general statement? One was a statement to the effect that it had been estimated that an indirect employment of about a million men was generated by the operation of the Bureau of Industry. How is that computation arrived at?

Dr. PARMELEE. That is a rather general estimate. I can only tell you who is responsible for the estimate: the officers and some of the research people of the Railway Business Association, which is a trade association of those who manufacture railroad supplies, equipment, and so forth. They have made their own studies, and have arrived at that conclusion, which is purely an estimate and can be nothing else.

Mr. O'CONNELL. In looking at one of your tables, I noted that in the past 8 or 10 years, the amount spent for equipment and on roadways, construction, and so forth, was very substantially less in amount per year than had been the case during the twenties.

Dr. PARMELEE. Yes.

Mr. O'CONNELL. That would seem to me to indicate that whatever indirect employment was being created during these recent years was probably not as great relatively as it had been during the previous decade, when much more money was being spent for maintenance and new equipment.

Dr. PARMELEE. That is true. Those figures fluctuate up and down, and they are in line with the volume of purchases and the volume of capital expenditure.

Mr. O'CONNELL. But that indirect employment consisted in large part, at least, of employment created in producing such things as new rolling stock and equipment, and so forth.

Dr. PARMELEE. Equipment, steel rails—2,000,000 tons of steel rails in the course of a year make a good deal of employment—production of ties and ballast, fuel, and any one of the 70,000 different items the railroads purchase.

Mr. O'CONNELL. Then the other question I had was about the statement you made to the effect that the price structure, so to speak, or the rate structure, was somewhat inflexible, partly, at least, because of Government supervision, and you indicated that that made it somewhat difficult to take into account increases in cost, since the inflexible rate structure made it difficult to pass on increases in cost. That would also put you, you say, on the downswing. Would it be as difficult to pass on decreases in cost, because of the inflexibility of the rate structure?

Dr. PARMELEE. Well, the competitive pressure on the railroads to reduce their rate is so great and has been for some years, that, generally speaking, it is much easier to secure a reduction than an increase. I am speaking of rates. And the reductions have been made in a great many commodities, hundreds of them, in fact, over recent years, when it would probably be very difficult to get increases on the same commodities and to the same extent.

Mr. O'CONNELL. You mean that an application for reduction in rates would be more apt to be favorably handled by the regulatory agency than an application for an increase?

Dr. PARMELEE. An application for a reduction, generally speaking, is not complained of by anyone, and about the only time that it would be even suspended and considered would be when there was a complaint, possibly by some other railroad.

Mr. O'CONNELL. Or by some of the competitors?

Dr. PARMELEE. Or by some interested shipper, or if some member of the Commission staff felt that a proposal was being made to effect

a cut which might go below the reasonable minimum and might upset the rate structure with respect to that particular commodity.

The committee does occasionally step in and in effect establish a minimum below which it will not permit a carrier to go. But those are occasional instances.

MR. O'CONNELL. Just a question on procedure. When the railroad proposes to increase or change a rate-structure, either in the upswing or the downswing, what do they do, file a new tariff schedule?

DR. PARMELEE. The tariff is filed with the Commission, and it remains on file 30 days. If no objection is raised or no suspension is made by the Commission itself, it goes into effect automatically. It may be suspended, however, and of course, if a complaint is filed, the Commission usually suspends it and has a further investigation.

I said a moment ago, Mr. Chairman, that I thought this little booklet would speak eloquently of the progress of the railroads in the field of technology in recent years, and when I use the word "technology"—I am going to use it frequently—I am willing to adopt the definition submitted to the committee last week by Dr. Kreps.

So far as the railroads are concerned, I think we might use the word "technology" as merely everyday language, meaning "progress in the art of good railroading." I think the committee would understand what that means in all of its aspects.

PHYSICAL PLANT OF THE RAILROADS

DR. PARMELEE. May I direct your attention first, Mr. Chairman, to page 7 of this booklet, which has been submitted to the Committee under the general title of *Railways of the United States, Their Plant, Facilities, and Operation*, and is dated 1940.

Page 7 is submitted as "Exhibit No. 2491," the upper half of the page. I think there is little comment needed on this exhibit, Mr. Chairman, except to point out that the peak of miles of road, so far as the period covered by this table is concerned, was in 1929 when 260,570 miles of road were operated in the United States.

(The table referred to was marked "Exhibit No. 2491," and is included in the appendix on p. 17350.)

DR. PARMELEE. This table, by the way, applies to all line-haul railways, not just the Class I railways. In 1939 that total had been reduced to 246,800. The reduction, however, in the final or right-hand column, "Total, all tracks," has not been so great. "All tracks," the committee will understand, include not only miles of road—that is, mileage extending between termini—but includes the second main track, the third, fourth, fifth, and sixth main track, each counted as a single mile, and it includes also the so-called yard tracks and sidings, yard tracks being the tracks within terminals, and sidings being sidings out on the road, mostly for the purposes of one train passing another.

SENATOR KING. There are many miles of tracks in the large stations, are there not? For instance, take the station here in Washington. When you look at the tracks, you would think you have far too many sidings of tracks; they parallel each other there. I would imagine it would be 40 or 50 tracks.

DR. PARMELEE. That is true in the larger terminals, and you will notice that the yard tracks and sidings total 121,000 miles throughout

the United States, a considerable mileage. What I was about to say, Mr. Chairman, is that the percentage reduction in the total tracks has not been so great as in the miles of road. So that to some extent the industry, while it has been abandoning and cutting down some of the branch lines, has on some of its main lines been actually in some cases increasing its second and third main tracks, what you might call its subsidiary tracks. In other words, its growth has been in a sense intensive within the industry, and not extensive.

That will be brought out, I think, by looking at the lower half of page 7 of the booklet, "Exhibit No. 2492."

(The table referred to was marked "Exhibit No. 2492" and is included in the appendix on p. 17350.)

Dr. PARMELEE. That shows the miles of road constructed and the miles of road abandoned in each year from 1921 to 1939, together with a total for the period. You will observe that during the period as a whole, 19 years, 7,377 miles of new line were constructed, whereas 22,180 miles were abandoned, indicating a net loss of about 15,000 miles.

Senator KING. Did the new lines extend from one city to another where there had been no railroad communication previous to that time?

Dr. PARMELEE. If there had been no prior railroad communication; yes, sir; but in some cases, Senator, a proposal to add lines between cities where communication already exists has been turned down, either by the I. C. C. or by some State commission, on the grounds that there was adequate service already in that particular section.

Senator KING. What I was trying to get through my mind is whether "new lines" meant into fields which had no lines, or whether it included parallel lines between two points, added because of increased service or for reasons which seem best to the user of the line.

Dr. PARMELEE. If it happened to be a new company putting in the field a paralleling line, that would be counted. I was trying to point out that there would be very little of that sort of thing, mostly new lines in new territory, I think, and you will notice from the footnote these figures do not include adjustments, reclassifications, relocations, and so forth, within the industry; they are actually new lines of railroad.

Now, this loss of 15,000 miles during that period may seem to be serious, but when it is considered that that 22,000 miles of abandonment is practically all branch lines, and all of it has been subjected to careful investigation by the Interstate Commerce Commission before the abandonment may take place, all those facts taken together indicate that the abandonments were economically justified and that on the whole, they probably strengthened rather than weakened the railroad structure as a whole.

The railroads have not abandoned any of their main stems of railroad mileage in recent years. That, I think, is a point of sufficient importance to emphasize to the Committee.

Dr. ANDERSON. Dr. Parmelee, the question I wanted to raise was a trend in abandonment. In your table, the heavier years of abandonment coincided with the trough of the depression, more than half the 22,000 miles of abandonment of roads occurred from 1932 to 1939.

I was wondering whether you would care to comment on whether it is an economic procedure that forces abandonment, or what.

Dr. PARMELEE. I would say it is a cumulative procedure which grows out of both the impact of competition and the depression. Sometimes abandonment is proposed and either suspended or actually denied by the Commission. Then it is brought in again a year or two later, and at that time secures a favorable response.

In other words, these things accumulate as you go along, and I would say, speaking rather generally, that it was a cumulative procedure.

Dr. ANDERSON. Well, if that is true, how do you account for the fact that the second column, '31 through '39, shows about double the rate of abandonment as the first column, 1921-30, representing relatively good years.

Dr. PARMELEE. I think that follows from what I said. The second column to which you refer is the period of this depression as against the first column, which was a period on the whole of rather good business. But as the depression went on, and also as the competition was increased, which has been true of the last 10 years, you have this cumulative effect and the cumulative stimulus to abandon mileage and economize.

(Senator King resumed the chair.)

Dr. ANDERSON. Now a further question. There seems to be little or no diminution in the yearly rate of abandonment except for 1933. Would you care to hazard a guess as to what the future holds in terms of abandonment of railroads?

Dr. PARMELEE. I don't think anyone could make a guess on that. I would say that a certain amount of abandonment is necessary, even in good years, as business shifts. In some cases abandonment is due to the fact that a particular forest area is cut over, or some other natural product is exhausted, or something of that sort. Businesses move from one place to another and business conditions bring it about that certain lines of railways lose a large part of their traffic. All those things go on at all times so that I would say it is very hard to answer.

Mr. PIKE. It is possible, isn't it, Mr. Parmelee, that it is easier to effect an abandonment of a road if it has gone into receivership than it is when the parent road is in good financial condition, is able to take losses in a general pinch? I was thinking particularly of a reorganization plan brought out for the New Haven over this last week end. In that plan the lease by which the New Haven controlled the Old Colony is disavowed. If it goes through, the Old Colony disappears from the New Haven system, and there is substantial doubt as to whether it can exist as a separate road. If the New Haven were not in receivership it could not disavow the lease. I think there might be some time during receivership where a road with a great many miles of light-traffic branches could make its willingness to abandon more effective than if it were in a good financial position.

Dr. PARMELEE. Yes; I think it may be that in the process of reorganization an abandonment may more easily be brought about. However, I think that public resistance to abandonment is no less in the case of a reorganization than if the carrier is a prosperous one.

Mr. PIKE. It is merely that the receivership road can say, "Well, we are not going to keep this lease. As far as we are concerned the abandonment is effective. The child now is on your doorstep, not on ours."

Acting Chairman KING. While it isn't pleasant to point out our losses and business failures, have you any evidence tending to show losses to those who have invested, primarily, in the construction of railroads, and, secondarily in their stocks and bonds, during the past 10, 15, or 20 or 30 or 40 years?

Dr. PARMELEE. Losses from what source, Mr. Chairman?

Acting Chairman KING. Losses by those who have constructed railroads, put up the capital for their construction; the railroad has gone into the hands of the receiver, and the original stockholders lose all they put in; the bondholders lose perhaps all they advanced. Is there anything to indicate the aggregate losses sustained by those who have made investments directly and indirectly in our railroad system? It goes, perhaps, into hundreds of billions and much farther.

Dr. PARMELEE. I know of no figures on that, Mr. Chairman, but as you say it must be up in the billions.

Acting Chairman KING. Is there any capital available now of a venturesome character, or any character, for the construction of railroads?

Dr. PARMELEE. Mr. Pelley touched on that this morning. I might say very briefly I think I know what was in his mind. He said he thought that if some of these handicaps which he outlined were removed, new capital would be available, not of the stock variety perhaps but loan capital on very favorable rates of interest. That is true today so far as our equipment obligations are concerned. A railroad in receivership or in the hands of trustees the other day sold an issue of equipment trusts at a net figure of 2 percent per year. They were in the hands of trustees, if you please, and some of the more prosperous railroads have done better than that. Now, the mortgage bonds are in a little different class, of course, but even there, Mr. Chairman, when the conditions are somewhat more fully stabilized they will be able, in our opinion, to continue financing on a conservative basis.

Acting Chairman KING. Then the receivers' certificates would have a greater value than the stock or the bonds in some of these roads which are in the hands of receivers?

Dr. PARMELEE. By value I assume you mean security—a prior lien, in other words.

Acting Chairman KING. Marketable value.

Dr. PARMELEE. Yes; probably, because they have a prior lien.

Acting Chairman KING. You have indicated there that receivers' certificates would be sold at 2 percent interest?

Dr. PARMELEE. Oh, but that isn't a receiver's certificate, Mr. Chairman; that is an equipment trust obligation; that is a mortgage on the equipment, and that was put out by the company, by the corporation, not by the receiver.

Now, the people who bought those certificates evidently expect that company, that particular company, to come out of the hands of trustees in a short time, and make enough money out of their operations to meet the payments on the equipment.

Acting Chairman KING. Well, I assume there are sometimes multiple indebtednesses; the indebtedness to the original stockholders, then the indebtedness to the bondholders, then the indebtedness to the mortgagees, and then indebtedness to the receivers, and then indebtedness such as you have just described, so there would be several layers of indebtedness.

Dr. PARMELEE. There are several layers over layers on some of the properties.

Dr. ANDERSON. Mr. Parmelee, one more look at this construction side of the chart. I take it that construction of new railroad miles means use of labor?

Dr. PARMELEE. Yes; of course.

Dr. ANDERSON. And therefore of materials?

Dr. PARMELEE. And materials, and a radiating influence.

Dr. ANDERSON. So that anything that could be done to stimulate railroad construction to bring it back to the period '21-'29 would be most beneficial to labor?

Dr. PARMELEE. Yes; there is no question about that.

Dr. ANDERSON. If you will note the period from '21 to '29, you will see that the range was considerable, from something around 946 miles of road in the peak of '28; with a decided drop in '31-32, to 149 in 1937, which Mr. Pelley indicated was an unusually dynamic year in the railroad industry. Do you care to hazard a guess as to what the future might hold by way of a reasonable year-by-year occupation of the field? Could it correspond to the period '21-'29?

Dr. PARMELEE. I wouldn't even like to hazard a guess on that because a great deal depends on the development of certain kinds of traffic in new territories, and things of that sort. The development of oil in the Texas field made a good deal of business for some companies. I haven't any doubt that that mileage in the Texas field is included in this 1921-30 group that you speak of. To what extent we will have things of that kind in the future I am unable to say.

Dr. ANDERSON. In your studies you undoubtedly have gone into detailed analyses of miles of new road constructed. Have you come to any conclusion, from past experience, as to the type of new roads likely to be constructed?

Dr. PARMELEE. I would say it would be very largely in new fields.

Dr. ANDERSON. Dependent upon the general business situation.

Dr. PARMELEE. Oh, yes; almost entirely, and particularly new enterprise.

Acting Chairman KING. Well, those new enterprises that you have in mind would be largely in the present manufacturing and industrial centers, would they not?

Dr. PARMELEE. Not entirely, Mr. Chairman. Going back to my Texas oil fields illustration, there was development of a natural product, an exploration. The Texas fields, I understand, are the largest fields in the world now. That would not have been suspected a few years ago.

Mr. PIKE. If I am not mistaken, Mr. Parmelee, most of that mileage that was built down there was in the Lower Rio Grande Valley by the present subsidiaries of the Missouri Pacific and up in the Panhandle by the Santa Fe, mostly to get at the prospective wheat lands of western Kansas and the Texas Panhandle. I think if you look at

it you will find really very little actual extension of mileage built to serve oil fields. The Texas & Pacific goes through most of them, but there was very little real extension of mileage, as I remember.

Dr. PARMELEE. There has been some.

Mr. PIKE. Oh, some, but I don't think very much. I think you will find most of that was agricultural.

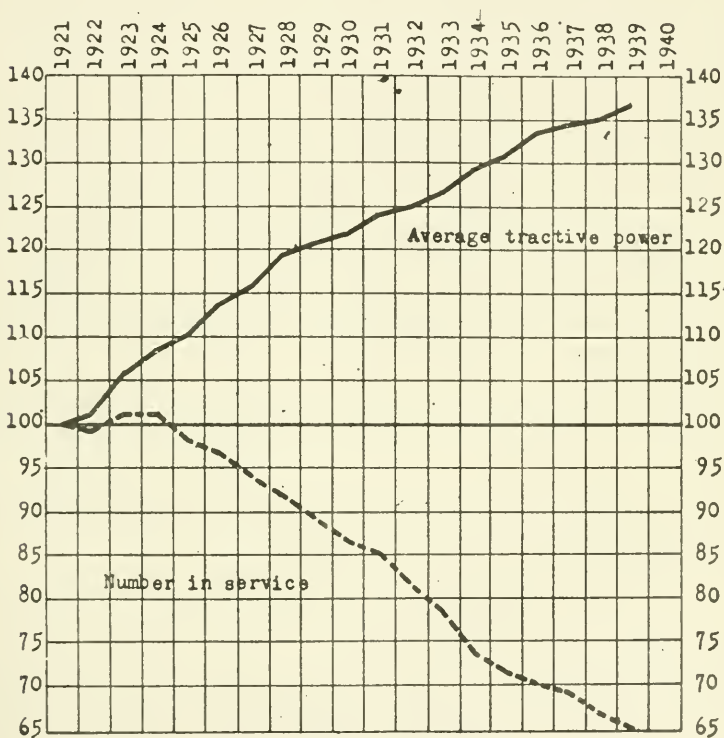
Dr. PARMELEE. I was using that as illustrative.

I would like to turn your attention, Mr. Chairman, to the chart and supporting table on page 8.

(The chart referred to was marked "Exhibit No. 2493" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17351.)

EXHIBIT No. 2493

LOCOMOTIVES - NUMBER AND TRACTIVE POWER,



Index numbers 1921 = 100.

NUMBER OF LOCOMOTIVES IN SERVICE

Dr. PARMELEE. That shows the number of locomotives in service of railways of class I at the end of each year 1916 and 1921 to 1929, and the average tractive power of steam locomotives in pounds per unit. I would direct your attention primarily to the chart, which shows that whereas taking 1921 as 100 there was an almost,

steady and rather sharp decline in the number of locomotives in service down to about 65 in 1939; there was also a rather sharp upward trend in the average tractive power, from 100 in 1929 up to 137 in 1939.

Acting Chairman KING. Was that increase due in part to the development of the Diesel engine?

Dr. PARMELEE. Very little. These are just steam locomotives.

Now the net result of the smaller number and larger tractive power of locomotives was that the aggregate tractive power, which is perhaps the important thing to think about, declined 11 percent in that period. Someone may say, "Well, did you have enough power? Did your business drop off during that period, and did you have enough locomotives with that 11 percent drop in locomotive power to take care of the business?" Between 1921 and 1939 there was actually a decline of 4 percent in the business—when I say business there I am including the freight and passenger business in terms of traffic units—so that you had a decline of 11 percent in power and a decline of 4 percent in business. The answer to the question whether you had enough locomotive power in 1939 is found, I believe, in the fact that during the whole of 1939 you had a very good surplus of locomotives in serviceable condition, a large number of them in white lead, that is, joints painted with white lead and put away as a reserve against the need for more power. Now the maximum number of locomotives so stored during the year 1939 was 3,845. The minimum number was 1,507.

Mr. PIKE. You had to pull them out pretty fast in September.

Dr. PARMELEE. The minimum, I was about to say, came during the peak traffic in the fall. The average throughout the year was 2,828. That would seem to give the answer to the question about power in the year 1939.

The same general answer, I think, would be made to the question with respect to freight-carrying cars shown in the chart and supporting.

(The chart referred to was marked "Exhibit No. 2494" and appears on p. 16559. The statistical data on which this chart is based are included in the appendix on p. 17351.)

Dr. PARMELEE. Here, too, you will observe, looking at the chart, that the number of freight-carrying cars in service declined rather rapidly from 100 in 1921 to 70.5 in 1939. At the same time, the average capacity of the freight-carrying car in tons was increasing, reaching a total of 117 in 1939 as compared with 100 in 1921.

The net of those two trends was a decline in aggregate tractive power of 14.7 percent. The freight traffic showed a decline over the same period of 8.7 percent, that is ton-miles, so that we have a decline in traffic of 8.7 percent and a decline in capacity to handle the traffic of 14.7 percent. Was there enough capacity to take care of the business in 1939? The answer there, too, is found in the figures of freight-car surplus during the year. There was no appreciable car shortage during the year, although on a few occasions there were a few hundred cars short at one or two places, the shortage being, I think, in every case taken care of within a period of 24 hours, so that speaking generally it may be said that there was no car shortage in 1939. There was a surplus of cars at all times during the

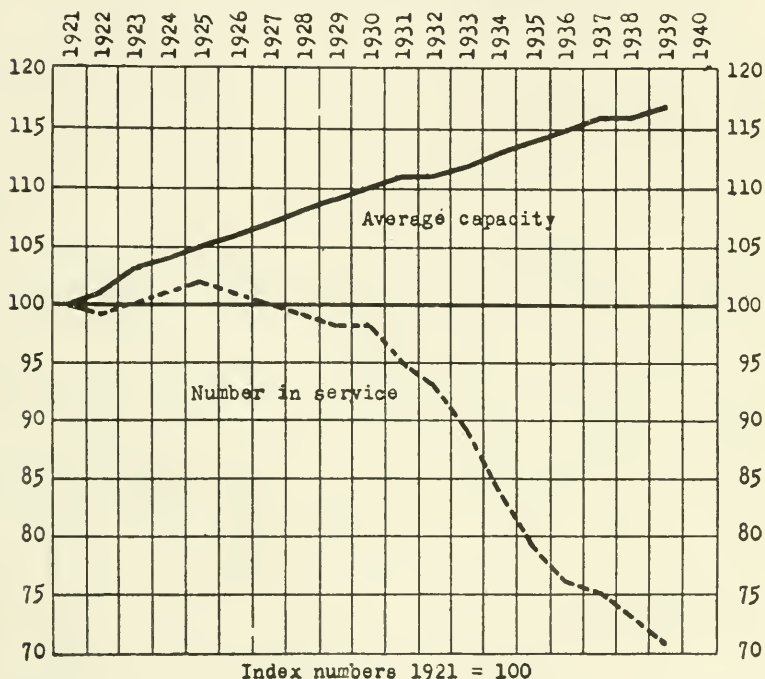
year, the average for the year being 194,000 in round figures, with a maximum of 291,000 and a minimum of 84,000, even at the time of peak traffic.

Acting Chairman KING. I don't quite follow your last statement. Where do you find the figures or proof on page 9 in support of what you have just explained?

Dr. PARMELEE. Those figures do not appear on the page. I was simply giving them to the committee as an answer to the question as to whether in view of the trends shown on this chart there was or was not adequate freight-car capacity in 1939.

EXHIBIT No. 2494

FREIGHT-CARRYING CARS



Mr. HINRICHS. Is 1939 a critical year as a test of the adequacy of capacity? Anticipating slightly on page 17 of your report, you show the tons of revenue freight originated as 1,016,000,000 in 1937, 902,000,000 in 1939. As a whole 1939 was a year of rather low business, and I thought that it was in 1937 that railroads received some test of the pressure of relatively full volume against capacity. The question that is asked with reference to railroad capacity now is not so much whether it adequately handled the traffic originating in 1939 as whether it could handle the sort of expansion of business that might reasonably be anticipated beyond 1939 levels.

Dr. PARMELEE. I think that is a very proper question to ask, Dr. Hinrichs, and I might answer it this way: You can speculate a good deal about these things; I think we all appreciate that. I think the test for railroad traffic came last fall during the 4 months from Sep-

tember 1 to the end of the year. From August to October, as you know, we had the largest relative rise in freight traffic that we have ever had in that same 2 months, and the actual freight traffic for the last 4 months of '39 was slightly greater than for the last 4 months of '37. It was at that time that the real test of railroad capacity came and the railroads, with the slight exceptions I have mentioned, met the test.

Mr. HINRICHS. But now let's see; the last 4 months of 1937, in terms of business activity, showed a general falling off. That decline became very sharp in October, at just the time that the railroads are ordinarily called on to meet the seasonal peak in the movement of agriculture. That is, you squeezed through 1937 partly because a decline in manufacturing volume occurred when you were meeting your usual seasonal peak in agriculture. Was that so?

Dr. PARMELEE. Yes, that is true; the peak almost always comes in October. I did not mean to enter into an argument with the committee as to whether we have enough equipment in hand, that is, freight cars, to take care of possible future increase of business; but I am simply using the last year we do have here on this chart, '39, and answering that question as to '39. Now, the important thing is to have equipment enough to meet the peak in each year. You don't have to worry very much about the rest of the year if you can meet your peak traffic demand. That is why I compared the peak in 1939 with the peak in 1937. Now, at the same time, we should recognize that on January 1, 1940, the railroads had more freight cars on order, new cars, than they have had on January 1 for a number of years. I haven't those figures in front of me, but that is a fact, so I think we can take that into account in this evaluation of the freight-car capacity of the railroads at the present time.

Acting Chairman KING. I want to ask, in view of several questions which have been asked, have you sufficient facilities now to meet not only the present demand but the immediate future demand for freight and passenger cars so far as you can judge what the future will bring for it?

Dr. PARMELEE. I wonder if you are willing to let Mr. Pelley answer that question.

Mr. PELLEY. Yes; we have, Senator, enough equipment and can get enough in time to meet any transportation emergency that might arise. To answer Mr. Hinrichs a little further, I think, last fall there was a great deal of apprehension as to whether or not we could handle the business because nobody knew where it was going to go. As the doctor said, we had the most precipitous rise in railroad traffic, August to October, that has ever occurred on the American railroads.

Acting Chairman KING. In the same time.

Mr. PELLEY. Yes, sir; the same period of time. It went up more quickly than ever before. Of course, the war was on and everybody who was around here during the other war began to think right away, "Will the railroads be able to handle it?" There was much interest, proper interest too, for that matter, and some apprehension, I think, that was due more to experiences of certain shippers and certain company officers during the previous war, but at no time was our capacity threatened, and we would have taken care of it if business had kept on going up; I wouldn't say how far, but we were not alarmed about it. We were very sorry that it quit going up. My com-

plete answer to you, Senator, is that we can meet any transportation emergency that might arise, no matter what the conditions are, whether we should become involved in this turmoil or not. There would be no apprehension on the part of the railroads as to whether or not we would be able to meet any situation that might arise.

Acting Chairman KING. That rather precipitous rise in demand for transportation grew out of the situation abroad, did it not?

Mr. PELLEY. Absolutely, I think partly in anticipation of price advances; people bought before they were quite ready, and deliveries were made before they were supposed to have been made; and partly because of anticipation of delay in receiving what one might order. The two things put together, I think, caused this precipitous increase. We moved goods in November and December that might otherwise have been moved in January and February. I have had shippers tell me that. I know that is true.

Mr. O'CONNELL. Does your organization have any figures or have you made any study as to the physical characteristics or age distribution of such things as your freight cars? I have heard it said that most of the freight cars or a very substantial amount of your rolling stock was quite old, say, 20 years or more. Do you happen to have any study on that?

Mr. PELLEY. We have figures but we haven't got them here. We could get them for you.

Mr. O'CONNELL. I think it was testified before the committee considering the financing bill last year that 40 percent of all the freight cars in the country were more than 20 years old and that only 3 percent of the locomotives now in use had been built within the past 10 years, and other testimony along that same general line. It occurred to me that the ability of the railroads to meet a continued high peak of operations would depend somewhat upon the ability of the existing equipment to stand the gaff over a period of time. Wouldn't that be a problem?

Mr. PELLEY. Yes; but, as I said this morning, a rebuilt locomotive is as good as it was, practically so, when it was new. The same applies to a rebuilt car. We have not as much obsolescence of equipment as is generally felt to be true. I haven't the exact figures in my mind, and I don't know that Dr. Parmelee has them, but we would be glad to submit them.

Acting Chairman KING. I understood Mr. Pelley's testimony this morning to be that your locomotives were practically as good as new, if they were not entirely new, because of your maintenance expenses and charges, and the same with your cars, so that your cars were all in good condition.

Mr. PELLEY. I wouldn't say that, Senator, but as a matter of fact someone quoted some figures from me this morning, I think, concerning the percentage increase in business that we were able to handle, that we could handle 25 percent more than last year, and by repairing the locomotives and cars in bad order we could handle 45; I think we probably said 40 this morning. Of course this acceleration in business last fall brought about some very extensive repair programs. Some railroads reduced the bad orders to a minimum, hoping that this business would continue, so our bad-order situation is much better than it was a year ago, and it is very well in hand.

We would like to have an opportunity to run a race with this business and see if we couldn't keep ahead of it.

Dr. PARMELEE. Right on that point, Mr. Chairman, it may be interesting to the committee to know that between August and January, which is the latest month for which we have figures, the railroads reduced their percentage of unserviceable or bad-order freight cars from 12.2 percent down to 8.6 percent. An average of about 6 percent is regarded as normal. You always have certain cars in the shops and so on, so you can't reduce your percentage to zero, but if you have no more than 6 percent of your cars in bad order you are considered as being in very good physical condition.

I would like to proceed, if I may, with some of these exhibits, moving along as rapidly as possible, because your time is running short.

Turning to page 10, "Exhibit 2495" shows the number of locomotives of different classes and the number of freight-carrying cars installed in each year from 1927 to 1939.

(The table referred to is marked "Exhibit No. 2495" and is included in the appendix on p. 17352.)

INSTALLATION OF NEW EQUIPMENT

Dr. PARMELEE. I would like to call the attention of the committee at this point to a factor which I shall refer to again, which has already been referred to, that the somewhat improved business of 1937 had a heartening effect on a great many different activities of the railroads.

You will notice looking at this exhibit that the number of steam locomotives installed in 1937 showed a considerable increase over those of the next preceding 4 or 5 years, and was greater also than in any year since. And the same thing is true of the freight cars.

The table at the bottom of page 10 is a statement of the number of passenger-train cars in service, class I railways, each year down to 1939.

(The table referred to was marked "Exhibit No. 2496" and is included in the appendix on p. 17352.)

Dr. PARMELEE. Now, there, too, I would like to make the comment in passing that between 1921 and 1939, while the number of cars in service declined about 30 percent, the business in terms of passenger-miles went down about 39 percent. So that the demands on the passenger-car capacity declined faster than the capacity itself.

Page 11 also shows a chart and supporting figures. It shows the number of long tons of rails laid each year from 1921 to 1938, and the number of wooden ties laid, classified as treated and untreated. You will notice that here, too, the number of tons of rail and the number of ties laid in 1937 showed an increase over preceding and over succeeding years.

(The chart referred to was marked "Exhibit No. 2497" and appears on p. 16563. The statistical data on which this chart is based are included in the appendix on p. 17353.)

Acting Chairman KING. That table doesn't show 1939, does it?

Dr. PARMELEE. It doesn't. I am sorry to say we haven't those figures complete as yet, Mr. Chairman.

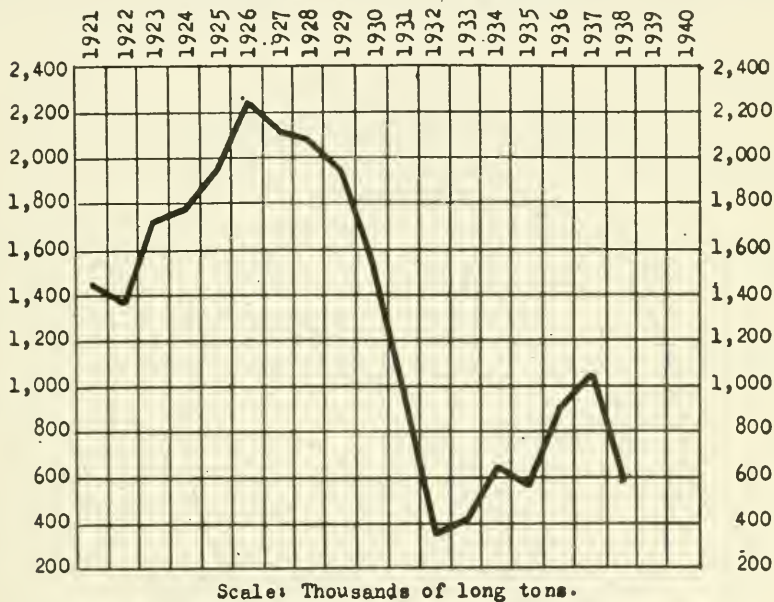
Acting Chairman KING. Would they be substantially the same as

Dr. PARMELEE. We think there will be an increase although we haven't the exact figures. One interesting thing in connection with the ties is a point to which I shall refer later, and that is that there has been a very marked increase in the number and percentage of treated as compared with untreated ties. That is one of the forward steps in technology on the railroads.

Briefly stated, during the first 4 years of the period covered by "Exhibit No. 2497," the average percentage of treated to total ties was 48.2 percent. In other words, less than one-half of the total ties installed were treated. In the last 4 years shown in the table, 1935 to 1938, inclusive, the percentage of treated ties was 78.5 percent; had gone up from less than half to more than three-fourths. Treated ties, of course, last a great deal longer than untreated ties and while they cost more by perhaps 50 percent, they last probably three times as long.

EXHIBIT No. 2497

NEW RAILS LAID IN REPLACEMENT



Dr. ANDERSON. What is the life of a treated tie?

Dr. PARMELEE. It is believed to be somewhere between 20 and 25 years, although they haven't been in the tracks long enough to reach an exact figure.

Dr. ANDERSON. And the difference would be that an untreated tie had to be removed say in 7 or 8 years?

Dr. PARMELEE. In about 7 to 8 years, depending upon the character of the tie and kind of wood it was, and the place where it happened to be, and the amount of traffic, and all the other considerations.

Dr. ANDERSON. Has there been any movement in the direction of even a more permanent tie than the treated wooden tie?

Dr. PARMELEE. Yes; steel and concrete ties have both been tested, but so far they have found nothing better, I believe than a treated wooden tie.

Acting Chairman KING. Creosote is still the best treatment?

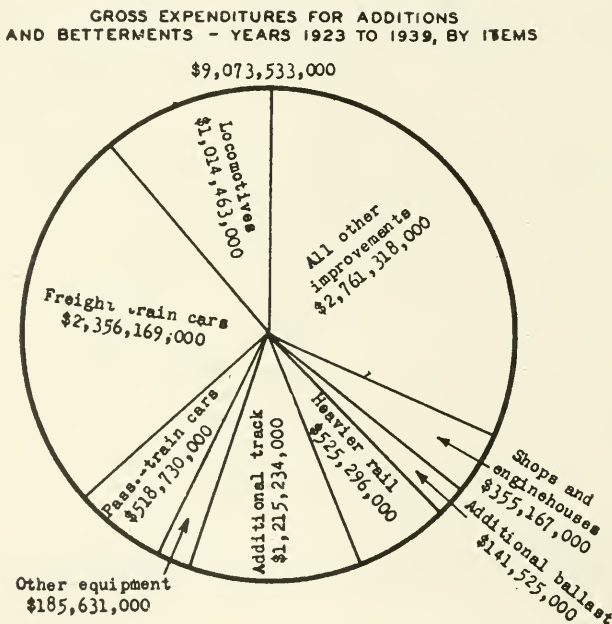
Dr. PARMELEE. Creosote and zinc chloride.

INVESTMENTS IN RAILROADS 1923-39

Dr. PARMELEE. The chart and supporting table on page 12 shows the amount of money spent by the railroads in capital improvements, what are known technically as additions and betterments, charged to capital account each year from 1923, when their improvement program began, to which Mr. Pelley referred this morning, and 1939. This shows that over the 17-year period covered by the table and the chart the annual average of capital expenditures for the various purposes indicated was \$534,000,000.

(The chart referred to was marked "Exhibit No. 2498" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17353.)

EXHIBIT No. 2498



Acting Chairman KING. I don't see that.

Dr. PARMELEE. I have obtained that figure, Mr. Chairman, by dividing the total of \$9,073,533,000 by 17, which is the number of years covered.

Acting Chairman KING. I see; yes. May I inquire whether any of that was new capital, or was it borrowed money?

Dr. PARMELEE. It came from various sources, Mr. Chairman. Some of it was borrowed money; some of it was out of depreciation reserves,

some was out of net earnings, and from whatever source it might come. Part of it was new capital, borrowed money.

Acting Chairman KING. No part of it was what might be denominated as original investment, was it?

Dr. PARMELEE. Original in the sense that you were borrowing new money; yes.

Acting Chairman KING. Well, was any part of that received for sale of stock?

Dr. PARMELEE. A part of it. During the better years of that period, in the later twenties some stock issued by some of the railroads was sold for cash, but that was a comparatively small proportion of the total.

Acting Chairman KING. By and large, the greater part of that capital investment was borrowed money?

Dr. PARMELEE. A considerable part of it; yes.

Dr. ANDERSON. Do you have any idea as to what proportion of the total was borrowed money?

Dr. PARMELEE. I couldn't answer that question, Mr. Anderson. I think you had some figures put into this very hearing by Mr. Barriger, if I remember rightly, on that very subject.¹

Dr. ANDERSON. Do you know whether the railroads went into the market to borrow that \$262,000,000 in 1939, or did they find it within their own reserves and depletion accounts?

Dr. PARMELEE. My answer there would be that most of the \$133,000,000 in the "Equipment" column, which is about one-half of the total, was borrowed under equipment trust certificates. As to the remainder, \$128,000,000, I am unable to answer your question.

Dr. ANDERSON. Would you hazard a guess as to the size of a normal borrowing, when the railroads are in the relatively healthy condition they found themselves in, say, in the twenties?

Dr. PARMELEE. Mr. Pelley made the statement this morning that the railroads could easily in fairly normal conditions expend \$500,000,000 a year or more on their property in the way of improvement work.

Dr. ANDERSON. And if they sought \$500,000,000 a year?

Dr. PARMELEE. To what extent that would have to be borrowed depends a good deal on the circumstances which were in effect at the time, of course.

Dr. ANDERSON. I was going to put it this way. If they sought that much money annually, what prospect is there of their finding the money within their own coffers, or of having to go into the open market for it?

Dr. PARMELEE. That would depend entirely on the degree to which their net earnings came back and that, of course, is a very difficult question to answer in advance.

Acting Chairman KING. Many of the railroads would find something like the lean place which old Mother Hubbard found when she wanted something for herself or her dog? I don't want to be critical.

Mr. PELLEY. Senator, you are interested in the amount of these capital expenditures, that had securities issued against them? Well, I should say that 60 percent of these were made out of earnings; not

¹ See Hearings, Part 2, pp. 3561-3576.

many of them capitalized by roads now paying interest on them; probably 60 percent was spent right out of money they made.

Acting Chairman KING: Earnings which ought perhaps to have been applied to liquidating obligations matured or unmatured, and denying any dividends whatever to stockholders?

Mr. PELLEY. Well, in some instances the money was spent rather than pay dividends, probably, but they either had to make the improvements out of earnings or finance them and issue securities against them in order to improve their plant, keep abreast of the business; it was a perfectly proper thing to do and a very laudable thing to do, and we probably would be in better shape—I know we would—if we made all of them out of earnings.

Acting Chairman KING. Those earnings were in part due to draining various resources which perhaps ought to have been retained or ought to have been applied for additional development.

Mr. PELLEY. No; I don't follow that. The railroads were reasonably prosperous in the twenties, and they were expanding their properties; they entered into this big program in 1923, and spent about \$7,000,000,000 before they finished it, and much of that was done right out of the earnings of the property.

Acting Chairman KING. I had in mind when I made that former observation the fact that I had received some letters from stockholders, some from mortgage holders, during the past few years indicating that they thought that instead of utilizing some of the earnings for the purposes you have indicated there ought to have been some payment in the discharge of obligations and in paying some dividends to the stockholders.

Mr. PELLEY. Yes; since you raise that I would like to clear up a point, if I may. You know many people think that our debts have been increasing; they haven't; they have been decreasing. Thirty years ago the railroads owed \$606 for every \$1,000 invested in their property. Today they owe only \$429 for every \$1,000 they have invested, so instead of our debts increasing, they are really decreasing, contrary to the general public feeling about them.

Acting Chairman KING. Proceed.

Dr. PARMELEE. Just one other comment on "Exhibit No. 2498," Mr. Chairman. Again I call attention to the fact that in 1937, which was one of the better years of the thirties, the best year since 1930, the amount expended for additions and betterments showed a very large and very healthy increase and has since fallen off. "Exhibit No. 2499"—

Mr. HINRICHS (interposing). May I ask a question for just a moment? Taking these last exhibits, 2495 to 2498. They all show a very substantial level of capital activity, capital accretion, in 1937; freight-carrying cars average about as many as you had from 1927 to 1930. Your total expenditures for equipment are about up to the averages of the 1920's, in contrast with the situation where, for example, in 1932 or 1933 you added only 1 steam locomotive and 13 electric and oil, gas, and electric locomotives. Now does that seem to you to indicate that you get capital investment in the railroads when, and only when, you begin to approach reasonably close to capacity operations, that your program hasn't been controlled essentially in terms of whether there was a general feeling of confidence, but

rather in terms of the very specific feeling that you now had reached a point calling for additional equipment for prospective traffic?

Dr. PARMELEE. I don't think it is quite so simple as that, Dr. Hinrichs. You remember that 1937 was the fourth in a series of years, each of which showed some increase in traffic and earnings over the next preceding year. In other words, it was the end, in a sense, of a cumulative period of improvement and betterment in earnings. Now I haven't any doubt that some of the railway managements would have been glad to make some of these capital improvements in some of the earlier years, but it was a financial restriction that was on them. But as you got an increase year by year over a period of years, the psychological effect would be that perhaps we were now on a permanently upward trend, or at least a trend that would continue for some time in the future. Therefore we can afford to go out and do some of this improvement work which we have wanted to do for some time. As a matter of fact, they guessed wrong and things turned down very sharply in '38, and we have only come part way back in '39 and '40.

But I think the psychology of the situation was more important than any other one factor.

Mr. HINRICHs. More important than the fact that your freight-car loadings were down to within 10 percent of the levels back in the 1920's, possibly 13 percent?

Dr. PARMELEE. That partly underlies the psychological factor, of course. But there are two factors in this business: partly what you need, and partly what you think you can afford to pay or what you have to pay with.

Acting Chairman KING. Would it be your view that notwithstanding the fact that hundreds of millions, and perhaps billions, have been lost in railroad development for various causes not necessary to enumerate, some of which probably would be charged to control by the Government, others to competition from subsidized organizations, you still think that there is a good future for the railroads and that regardless of the losses which have been sustained, there has been great good to the country in the development of the railroads?

Dr. PARMELEE. I think there is no question about the last remark you made, Mr. Chairman. Now about the future, I would make two general remarks and I don't want to get into too much detail. In the first place when we talk about the railway industry we ought to recognize that there are a number of railroads in the country which are prosperous; they have more than made their fixed charges right through the depression period every year, so that there are a number of companies which can finance reasonably on a sound and fairly low interest basis at any time. They always have and they probably always will, so far as we can look into the future. That is one answer.

The other is that people are looking for safe investments at low rates of interest, and their judgment as to buying the securities of any particular company, whether prosperous or not at the moment, will depend entirely on their forecast of the probable earnings of that company in the future. Those forecasts would be very carefully, probably rather conservatively, made, but if they conclude, as they will in some cases, that there is security in the future earnings for that particular investment, they will buy.

Acting Chairman KING. Well, I had in mind on that question the fact that so many railroads have been in the hands of receivers. Some have gone through very dark days, such as the New Haven and Union Pacific in its earlier days, the Rio Grande, the Western Pacific, and Rock Island, so that there is a considerable pessimism on the part of some persons as to the future of the railroads. But from your statement, and the statement of Mr. Pelley, it seems to me that the clouds are breaking and we have reason to believe that this very important part of our economy is to be preserved and to continue rendering very effective and important service for the benefit of the people.

Dr. PARMELEE. I think that is a very sound position to take, Mr. Chairman. I think that is in line with what Mr. Pelley said this morning and I certainly am in accord with it.

RAILROAD PURCHASES OF SUPPLIES

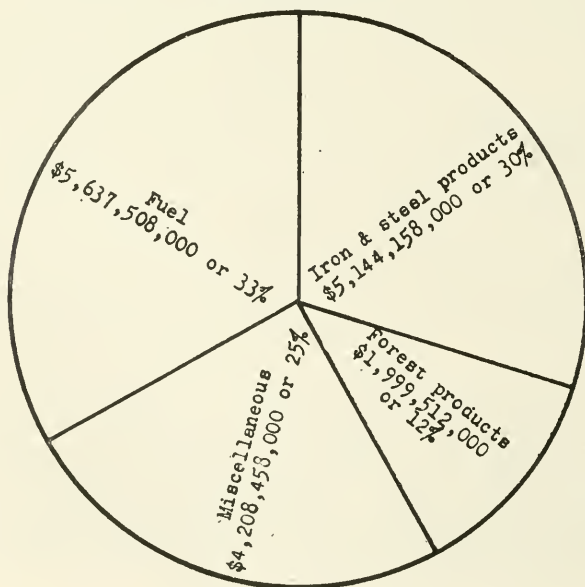
Dr. PARMELEE. I think I have reached now, Mr. Chairman, page 13, "Exhibit No. 2499," chart and supporting table on material purchases. The only comment I think I need make on that is to point out that in a period of 17 years the railroads expended approximately \$17,000,000,000 for fuel, for forest products, for iron and steel products, and for all the miscellaneous items which they buy from other industries. That is an average of approximately \$1,000,000,000 per year over good and bad years. And again you will notice that in 1937 they came very close to that billion dollars—\$966,000,000.

(The chart referred to was marked "Exhibit No. 2499" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17354.)

EXHIBIT No. 2499

RAILWAY PURCHASES - 1923 TO 1939

\$16,989,636,000



Acting Chairman KING. Well, would that include capital investment?

Dr. PARMELEE. These are just purchases of materials and supplies, the great bulk of which, Mr. Chairman, are used in operations. They are either consumed, like fuel, or used like steel rails, and other things, in their operations.

Dr. ANDERSON. Mr. Parmelee, I wonder if it would help to expedite matters if we could move quickly through the next two sections and get over into the part that concerns some technological developments, with your comment on anything that occurs to you in these two sections so that we could run through them and not lose what you wanted to give us by way of a connected account.

Acting Chairman KING. When you say "section" you mean pages 17 and 18?

Dr. ANDERSON. I am thinking now of pages 16 to 38. That deals with freight and passenger traffic and revenues, expenses and income of the railroads, and moves over to the section concerning employees and their compensation, which will be Mr. Parmelee's introduction to this technological topic as such. Would it be possible to do that?

Dr. PARMELEE. I will try to move as rapidly as possible, Mr. Anderson. On page 17, Mr. Chairman, there is a table labeled "Exhibit No. 2500," which shows the originating tonnage of freight on the railways of class I on each year from 1931 to 1939.

(The table referred to was marked "Exhibit No. 2500" and is included in the appendix on p. 17354.)

Dr. PARMELEE. I think the only points that need to be made in connection with this exhibit are first that from 1921 to 1939 there was a decline of 4 percent in the total freight tonnage, but that that decline was quite different as related to different groups of commodities. There was a decline of actually 65 percent in the so-called l.c.l. freight, or less-than-carload package freight, the final column in the table. There was a decline of 38 percent in animals and their products, such as livestock, which now largely moves by truck; there was a decline of 34 percent in products of forests, lumber and timber products; there was a decline of 20 percent in products of agriculture; there was a decline of less than 3 percent in the products of mines, which shows where the railroads are still practically supreme in their particular field, and there was an increase of 35 percent in manufactures and miscellaneous. Those are largely the miscellaneous classes of manufactured goods.

A very important and significant increase.

Dr. PARMELEE. "Exhibit No. 2501" is a chart, with supporting data, showing the freight traffic over the same general period in terms of tons originated and revenue ton-miles.

(The chart referred to was marked "Exhibit No. 2501" and appears on p. 16570. The statistical data on which this chart is based are included in the appendix on p. 17355.)

The same general picture is shown for passenger traffic in the chart, with supporting figures on "Revenue Passenger Miles."

(The chart referred to was marked "Exhibit No. 2502" and appears on p. 16571. The statistical data on which this chart is based are included in the appendix on p. 17355.)

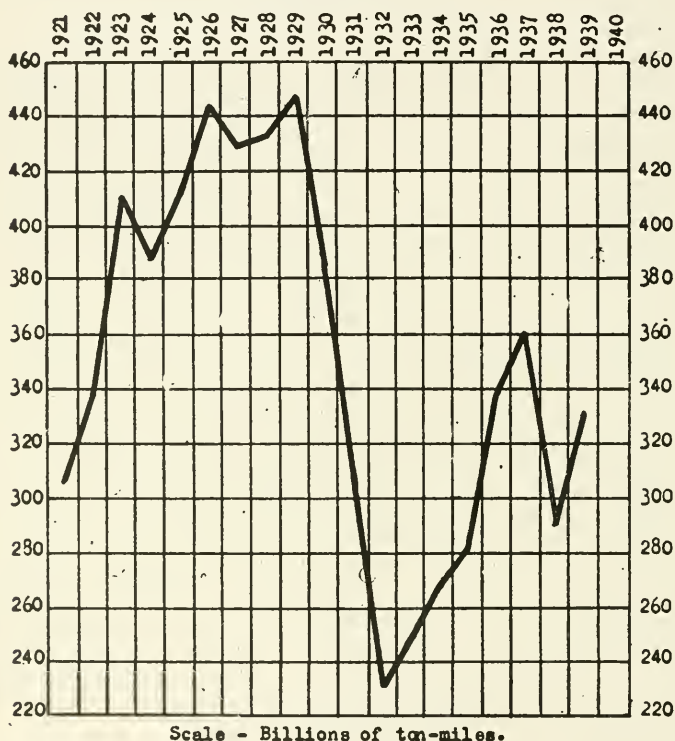
Dr. PARMELEE. Here, however, the passenger traffic showed a decline of a little more than one-half, and has recovered about one-third of that decline.

"Exhibit No. 2503" on revenues per ton-mile shows the gradual decline in price of freight transportation on the railroads in terms of average revenue per ton-mile.

(The chart referred to was marked "Exhibit No. 2503" and appears on p. 16572. The statistical data on which this chart is based are included in the appendix on p. 17355.)

EXHIBIT No. 2501

REVENUE TON-MILES



Dr. PARMELEE. I want to say that this is not an exact measure, because the average revenue per ton-mile depends on several factors, one of which is the actual rate per ton-mile. However, it is an approximate measure, and the committee will note the general downward trend.

Mr. HINRICHs. That chart has been drawn in such a way as to show relatively small changes. It appears to be a very precipitous decline. Actually, you start with the post-war period of a generally high-price level, and relatively high freight rate back in 1921. You come down to the end of the 1930's with a rate of about 1.08 cents per ton-mile, and that declines so that through the period from 1934 to 1939 it is in the neighborhood of 0.98 cent per ton-mile.

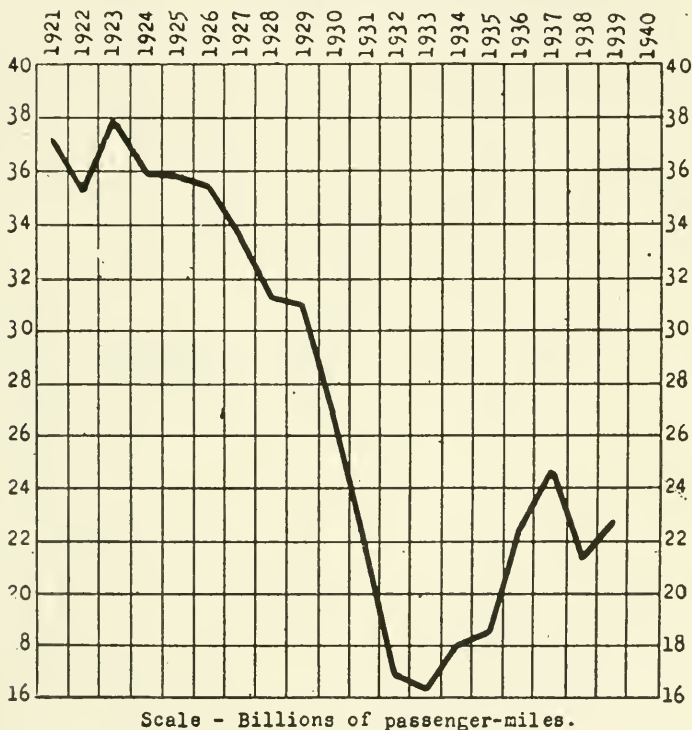
The decline is about a 10 percent decline during that period, as indicated by your table. Is that correct?

Dr. PARMELEE. I didn't get the years you were comparing.

Mr. HINRICHs. The period 1926-29, and the period 1934 to 1939, with an unusually low point in 1937 that I suppose reflects, among other things, the composition of the freight loadings in 1937.

Dr. PARMELEE. It represents that in part. In part, the latter part of that year, in November and December and in March '38, there was an increase in certain of the freight rates. Those increases are re-

EXHIBIT No. 2502

REVENUE PASSENGER-MILES
Railways of Class I

flected, of course, in 1938 and 1939 averages, but do not appear in the 1937 average.

Mr. HINRICHs. But in general, contrasting the late twenties and the period since 1934, there has been approximately a 10-percent change.

Dr. PARMELEE. About 10 percent, roughly.

Mr. HINRICHs. A 10-percent change in the revenue per ton-mile.

Dr. PARMELEE. Yes; that is correct.

Mr. HINRICHs. While the general price level would, of course, decline considerably more than that.

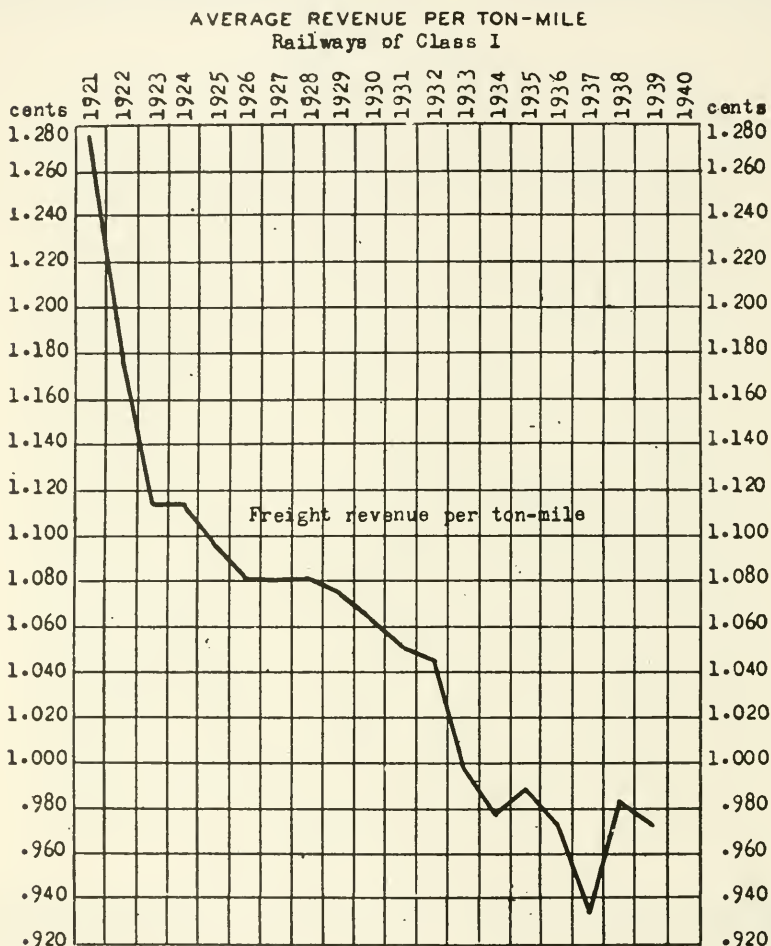
Dr. PARMELEE. I have some figures on the prices railroads pay or have paid, a little later on in this same statement.

The passenger figures are shown in "Exhibit No. 2504."

(The chart referred to was marked "Exhibit No. 2504" and appears on p. 16573. The statistical data on which this chart is based are included in the appendix on p. 17356.)

Dr. PARMELEE. That shows an even sharper decline in terms of average revenue per passenger-mile than was the case in terms of

EXHIBIT No. 2503



average revenue per ton-mile; in fact, during the last 5 years, the average revenue per passenger-mile has been the lowest in the history of the American railway.

DIVERSION OF TRAFFIC FROM RAILWAYS

Dr. PARMELEE. "Exhibit No. 2505" is a comparison in chart form of the trend from 1928 to 1939 of an index of general distribution,

with an index of railroad shipments. The index of distribution is the upper or the dotted line, while the index of rail shipments is the lower or heavy line.

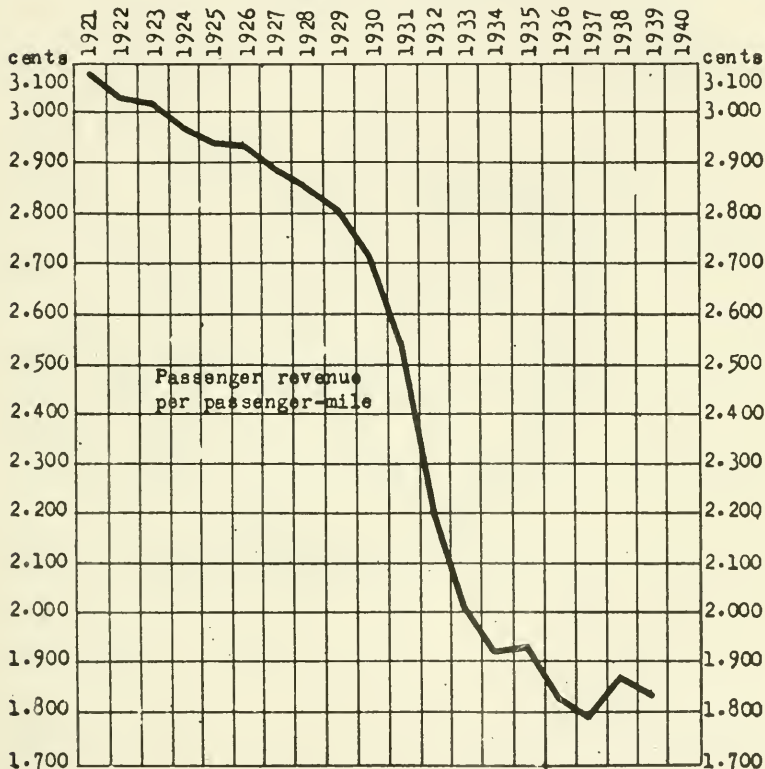
(The chart referred to was marked "Exhibit No. 2505" and appears on p. 16574. The statistical data on which this chart is based are included in the appendix on p. 17356.)

Dr. PARMELEE. In each case, the figure for 1928 was taken as 100, and the entries for the remaining years were plotted on the basis of that as 100.

EXHIBIT No. 2504

AVERAGE REVENUE PER PASSENGER-MILE

Railways of Class I

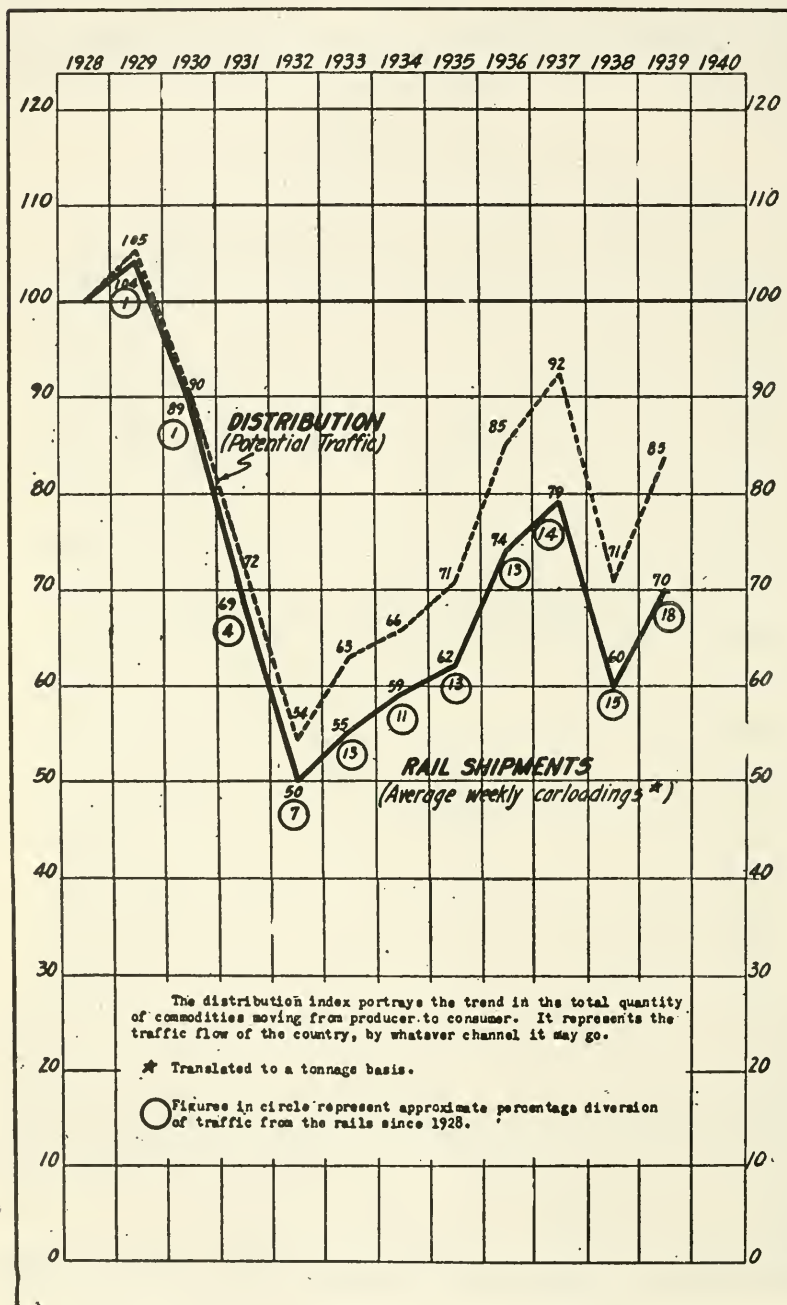


Distribution is worked out on the basis of those commodities which in 1928 moved by rail, weighted according to the actual distribution of traffic in 1928. The important thing from the point of view of the Committee, I think, is to look at the figures for 1939. You will notice that the entry for distribution is 85, which means that in 1939 actual distribution of commodities in this country that moved by any and all forms of transportation was 85 percent as great as it was in 1928.

The actual movement by rail in that year, 1939, was only 70 percent as great as it was in 1928. The difference between 85 and 70 is

EXHIBIT No. 2505

INDEXES OF DISTRIBUTION AND RAIL SHIPMENTS 1928=100



the spread or diversion of rail traffic to other forms of transportation. In other words, it is that part of the total movement of freight which, had the railroads carried the same percentage of the total in '39 as in '28, would have gone by rail.

Now, 70 is 18 percent less than 85 as a matter of percentage relationships. That 18 is shown in a round circle on the chart which seems to indicate that so far as the thing can be measured at all, 18 percent of the traffic which since 1928 might have moved by rail, has actually been diverted and has gone to other forms of transportation.

Mr. PIKE. That is a pretty general list; it covers a wide spread of commodities; does it not? :

Dr. PARMELEE. Yes; and of course the Committee will understand that even in 1928 the railroads had lost a good deal to other forms of transportation, so the 18 percent does not give the whole amount of loss to competitive forms, but only that portion which has been lost since 1928.

"Exhibit No. 2500" is a condensed income account of the railways of class I from each year after 1929 to 1939.

(The table referred to was marked "Exhibit No. 2506" and is included in the appendix on p. 17357.)

Mr. HINRICHS. Going back, Dr. Parmelee, for a moment to "Exhibit No. 2505," you have filed with the Committee a technical memorandum as to the way in which those various indices have been constructed. Have you a copy for the record?

Dr. PARMELEE. I have it here, and if the Committee would like, I would be glad to submit it.

Dr. ANDERSON. It can be marked "Exhibit No. 2507."

(The document referred to was marked "Exhibit No. 2507" and is on file with the Committee.)

Dr. PARMELEE. That is entitled *Railway Freight Traffic Trends*.

Senator KING. Would you like to have the exhibit printed, or would you just have it filed?

Dr. ANDERSON. I understand it will have to have an exhibit number; it need not necessarily be printed, but we will take it as a file exhibit.

Mr. HINRICHS. In connection with the figures on diversion,¹ there is a very rapid jump that occurs in 1933. From 1933 through 1938 there was not a very great change in your diversion ratio.

It is possible that that increased diversion that occurred between 1929 and 1939 was due to the relatively slow movement downward of freight rates during that period. The big drop occurred between 1932 and 1933, but up to 1932, which is when general prices had been going down considerably, there had been only a very slight movement in average revenue per ton-mile.

My first question would be, therefore, do you think that the development of that spread is related to the maintenance of freight rates during that earlier period of depression?

Dr. PARMELEE. I think that is rather a hard question to answer, Dr. Hinrichs, because the oncoming of the depression during that period was of course a feature which overwhelmed all other economic factors. Now, whether the relative level of the freight rates had anything to do with it, or to what extent they affected it, it is very hard to say.

¹ See "Exhibit No. 2505," appendix, p. 17356.

I do know this, if I may add to that, that as the traffic was being gradually diverted away from the rails, the carriers naturally were stimulated to further reductions in their rates, which brings about the so-called erosion in freight rates, the nibbling away of a rate in order to retain or regain traffic on the rails.

(Mr. Pike assumed the chair.)

Mr. HINRICHS. Those are separate problems, almost, are they not, the retaining and the regaining, in a very considerable measure? Business relationships and ways of doing business persist from year to year, and will stand considerable strain before a change-over of process or of methods of doing things is undertaken. Once that transition has been made, it becomes much more difficult to induce the businessman to swing back to the older method, and the problem of retaining traffic is somewhat simpler than the problem of regaining it, wouldn't you agree?

Dr. PARMELEE. I agree thoroughly, but I would also say that the railroads have been trying to do both. They are trying to retain their traffic and in many specific cases they are also trying to regain traffic which they hope has been lost to them only temporarily.

Mr. HINRICHS. To go back to the period 1929-32, you show in your table that the potential traffic was cut almost in half. The index stands at 54. During that same period, in "Exhibit No. 2503" you show that the average revenue per ton-mile was 1.08 cents in 1938, and was 1.046 cents per ton-mile in 1932; that is, there had been a reduction in the revenue per ton-mile of approximately 2 percent.

Now, what were the devices that the railroads were using most energetically during the period 1929-32 to retain their share of the freight traffic of the country?

Dr. PARMELEE. There are two, I would say, in particular. One is this erosion of rates or the gradual reduction of rates, here and there, over specific routes, and on specified commodities in order to offset the effect of competition, and the other is, of course, an effort to improve operations, particularly in the matter of speedy transportation—more speedy service.

I will show you figures later on which will show that during that period, as well as before and since, there has been a marked increase in the average freight transportation.

Mr. HINRICHS. Would it be your impression that a net reduction in rates of 3 percent during that period was effective competition against the reduction of rates that were being offered by truckers, for example?

Dr. PARMELEE. That average was made up probably of a great many larger and smaller reductions in specific cases, and it is very hard to generalize on the basis of an average. I would say that many reductions which were made were greater than that average.

Acting Chairman PIKE. If there is any way to dodge over to page 36, I think we might try to do it.

Dr. ANDERSON. Mr. Chairman, I am very thankful to you for the suggestion, because, as you know, we have a heavy schedule and we are trying to hear two witnesses a day.

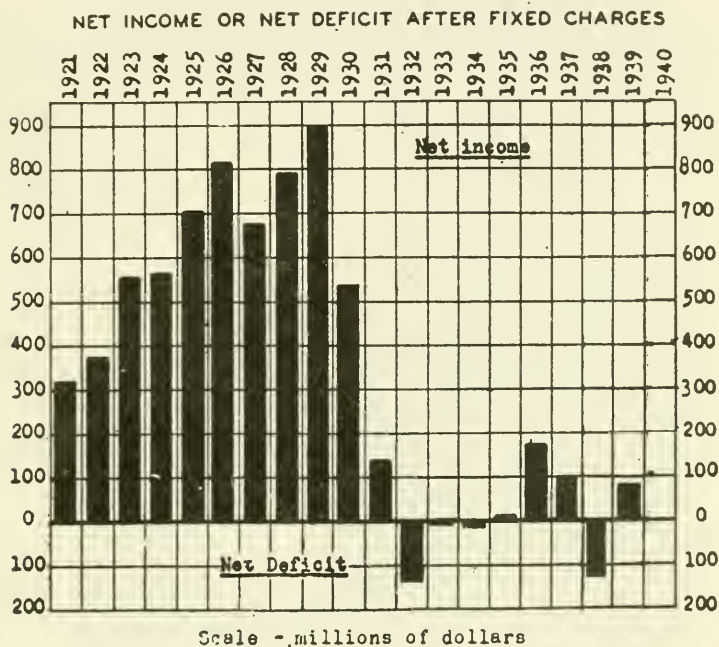
Acting Chairman PIKE. It does seem to me that the material in between where we have just been and page 36 or 37 is very interesting, but I don't think it bears quite as directly on the topic the committee

is working on as from page 37 on. I wonder if we might print the material between there in the record.

Dr. PARMELEE. I might then briefly refer to the exhibits which should be noted on each page and pass on.

(The charts referred to were marked "Exhibits Nos. 2508 to 2516" and appear on pp. 16577-16581. The statistical data on which these charts are based are included in the appendix on pp. 17358-17361.)

EXHIBIT No. 2508



Dr. PARMELEE. I would like, Mr. Chairman, just a minute to call attention to the price figures in "Exhibit No. 2516," which are indexes of the price the railroads pay for the commodities they buy. We use May 1933 as 100 only as a matter of convenience, because we happened to start our index on that date. In December 1926, the only previous year for which we have any figures, the index was approximately 150; it dropped to 100 in May 1933, which was about the bottom of the depression, and has since come back to approximately 133. In other words, the price has gone up about two-thirds of the way it came down from 1926 to 1933.

TREND OF EMPLOYEE COMPENSATION

Dr. PARMELEE. I think some comment should be made on "Exhibit No. 2517," which deals with the general trend of employees, hours, and compensation of employees of railways in class 1.

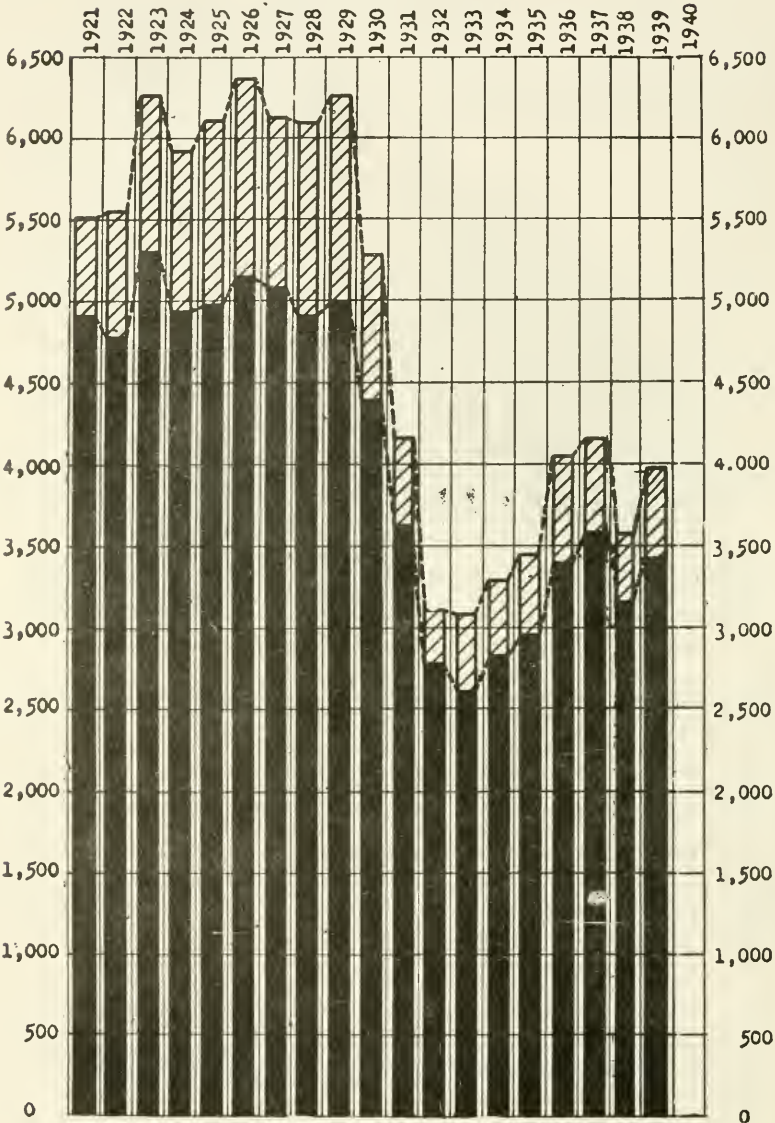
(The chart referred to was marked "Exhibit No. 2517" and appears on p. 16582. The statistical data on which this chart is based are included in the appendix on p. 17361.)

EXHIBIT No. 2509

TOTAL OPERATING REVENUES, TOTAL OPERATING
EXPENSES AND NET RAILWAY OPERATING INCOME

Railways of Class I

Scale - Millions of dollars



Black portion represents Operating costs, and taxes.
Shaded portion represents Net Railway Operating Income.
Entire bar represents Total Operating Revenues.

EXHIBIT No. 2510

RATE OF RETURN

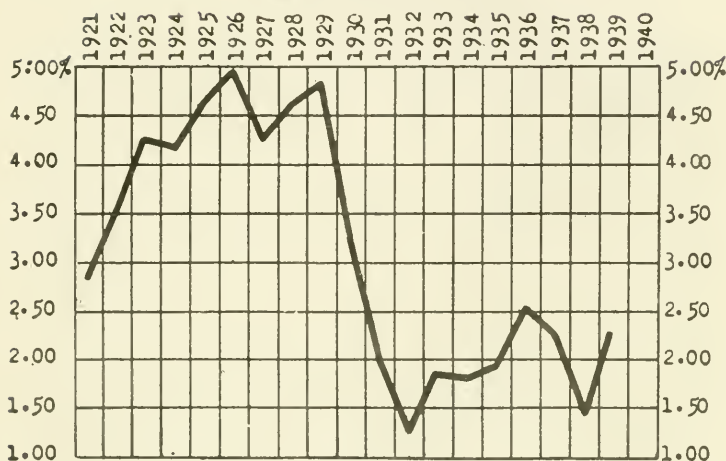


EXHIBIT No. 2511

[Submitted by the Association of American Railroads]

1939 AND 1916 RAILWAY DOLLAR COMPARED

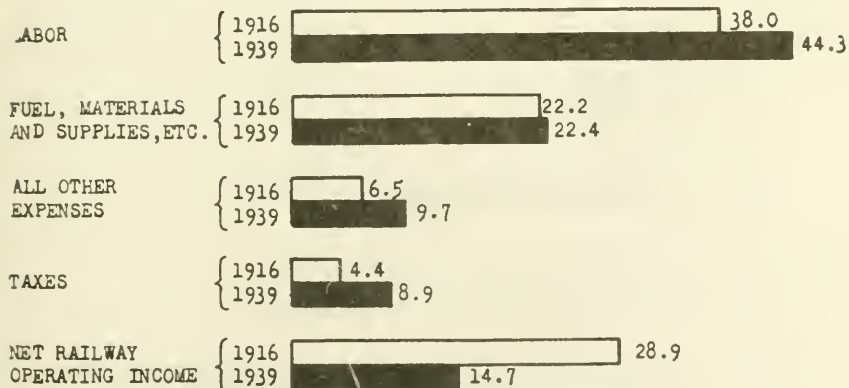


EXHIBIT No. 2513

[Submitted by the Association of American Railroads]

MAINTENANCE RATIO

(Ratio of total maintenance expenses to total operating revenues)
Railways of Class I

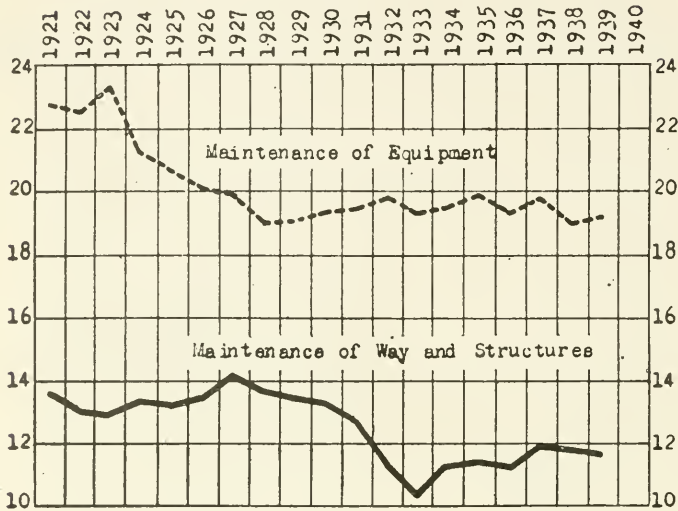


EXHIBIT No. 2514

[Submitted by the Association of American Railroads]

FIVE YEAR AVERAGES COMPARED WITH YEAR 1916

- Cents per dollar of total operating revenues
- Cents per dollar of net railway operating income before tax=

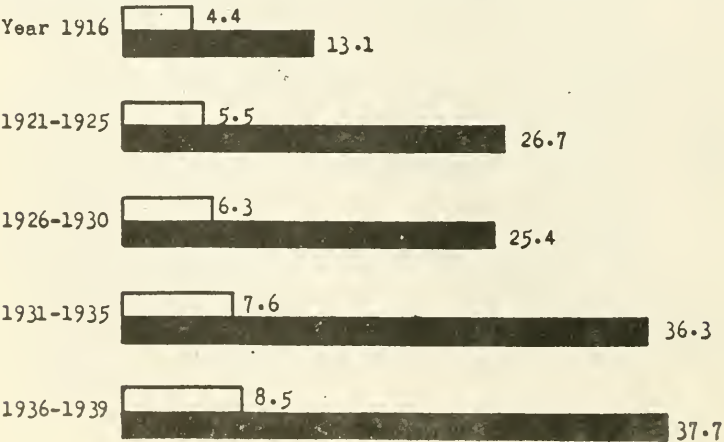


EXHIBIT No. 2515

[Submitted by the Association of American Railroads]

PER CENT OF TOTAL MILEAGE OPERATED BY RECEIVERS OR TRUSTEES

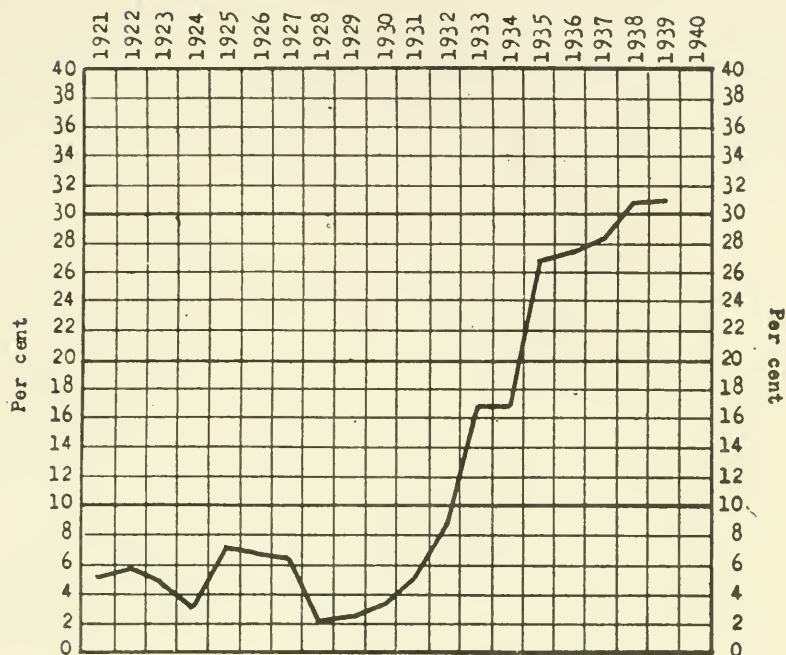
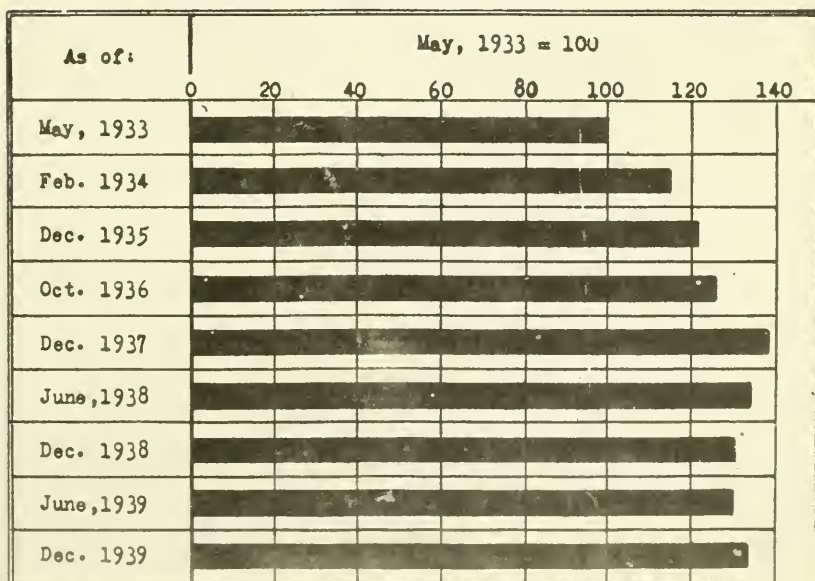


EXHIBIT No. 2516

[Submitted by the Association of American Railroads]

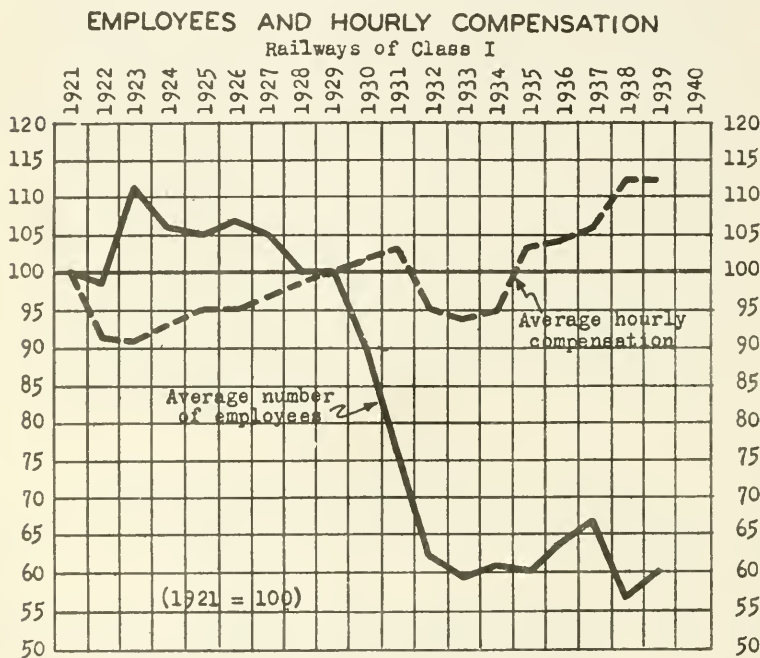
TREND IN RAILWAY SUPPLY COSTS SINCE MAY, 1933



Dr. PARMELEE. In 1916, prior to the entry of this country into the war, the average number of employees on this group of railroads was 1,647,000. Mr. Pelley has stated, the peak of 2,022,000 was reached in 1920, which was largely a year, or at least in part a year, of Federal control or Federal guaranty. In 1921, you will notice a figure of 1,660,000 in round figures, with some ups and downs following in part the increases and decreases in traffic. That figure remained between 1,600,000 and 1,800,000 from 1923 to 1929, when it was still 1,660,000. It showed a sharp drop in 1930, when the traffic also showed a sharp decline, another drop in 1931, another one in '32, and still an-

EXHIBIT No. 2517

[Submitted by the Association of American Railroads]



other one in '33, when we thought it had reached the bottom of the depression period, 971,000. There was an increase in '34, a slight decrease in 1935, another increase in 1936, when a subsidiary peak of 1,115,000 was reached in 1937. Following, however, the precipitous drop in business we had in 1938, the number dropped to 939,000, a smaller figure than was reached even in the year 1933, with some come-back to about 988,000 in 1939.

Acting Chairman PIKE. Not quite as low in total number of hours.

Dr. PARMELEE. I was coming to the hours in just a moment.

Turning to the hours, it will be noticed that the hours per man per year very generally show a rather sharp decline over the period, from 3,150 hours in 1916 down to around 2,500 hours in the last 4 or 5 years. However, between 1938 and 1939 there was a slight increase in the number of hours, which means more regular employment for the men,

some of the men going from 4 days a week to 5 and from 5 to 6, and things of that sort, the increase, however, not being a very large one.

Turning to the average compensation in the last two columns of the table, both on a basis of cents per hour and dollars per employee per year, the story, except for the period of the temporary deduction in wages from 1932 to 1935, is a story of almost steady increase, both average per hour and average per year. As a matter of record, I should perhaps say that on February 1, 1932, the employees took a voluntary deduction of 10 percent in their wages, and that ran, by a succession of agreements between managements and men, until July 1, 1934. On that date the deduction was changed from 10 percent to $7\frac{1}{2}$ percent. In other words, $2\frac{1}{2}$ percent was restored. On January 1, 1935, another $2\frac{1}{2}$ percent was restored, and on April 1, 1935, the remaining 5 percent was restored.

I should perhaps say at this time that while that deduction did not apply to higher-salaried forces, most of the forces that received higher salaries received cuts much in excess of 10 percent; several of them got 3, 4, and 5 successive cuts that in the aggregate amounted in some cases to as much as 50 percent. Some of those cuts have not yet been restored.

Mr. HINRICHS. I am not sure that I altogether understand this table. How is that average number of hours per employee figured? That is an annual average?

Dr. PARMELEE. That is an annual average, based on the total number of hours paid for, so far as the aggregate hours are concerned. The average number of employees is, of course, the average of the midmonth count 12 times a year, added together and divided by 12. That average in turn is divided into the aggregate of hours to get the average number of hours per employee.

Mr. HINRICHS. But how does it get up as high as 2,500? What would be full-time hours?

Dr. PARMELEE. The average number of men is probably men in full-time positions, which would be somewhat fewer or smaller in number than the total number of men employed at any time during the year. The number of men shown here is really what might be called the standard number of positions, working positions.

Mr. HINRICHS. These are the number of men actually at work on a particular day.

Dr. PARMELEE. On the 15th of each month or the nearest working day, if that day happens to fall on a Saturday or Sunday.

Acting Chairman PIKE. Are any of these hours constructive hours?

Dr. PARMELEE. Yes; they may be; it is what is known as the hours paid for.

Acting CHAIRMAN. PIKE. You say you have 8 hours paid for on a 3-hour run.

Dr. PARMELEE. Why, if they operate only 3 hours and are paid for 8, the 8 go in there.

Mr. O'CONNELL. What is the average workweek in the industry? What number of hours is customary?

Dr. PARMELEE. Forty hours, Mr. Pelley thinks.

Mr. HINRICHS. On a full-time basis that is 2,080 hours.

Acting Chairman PIKE. Some of it must be constructive, more hours paid for than hours worked.

Dr. PARMELEE. They are, Mr. Pike.

Acting Chairman PIKE. Some work 55 hours a week on the average, 50, anyway.

Mr. O'CONNELL. A 50-hour week for 50 weeks of the year would produce 2,500 hours, and the average number per employee is 2,520 in 1939. I have a little difficulty in squaring that with the 40-hour week.

Dr. PARMELEE. Remember that the railroad works 7 days a week. That doesn't mean, of course, that the average man works 2,520, but I explained that this was really a count of the normal number of positions.

Acting Chairman PIKE. Then the average man did not receive \$1,886.

Dr. PARMELEE. No; it is the average per position, not the full-time positions but the normal number of positions. A position might not run for the whole year, but it is the average number of positions which are counted on the 15th of the month.

Dr. ANDERSON. Mr. Parmelee, do you have any data that show by actual record the full-time earnings of persons employed in railroads?

Dr. PARMELEE. I think the best thing of that sort is made by the Railroad Retirement Board for the years 1937 to 1938. I haven't those figures before me, but they show the number of men who in each of those years received pay in each of 12 months. Even that doesn't mean necessarily full-time employees, but a man receiving pay in each of the 12 months throughout the year comes pretty close to being a steady, regular, full-time employee, and they show the earnings of those men.

Dr. ANDERSON. Do you remember what it is?

Dr. PARMELEE. They come about to the \$1,886 or very close to it.

Dr. ANDERSON. That is, the average compensation per employee here you think is about normal for a full-time employee.

Dr. PARMELEE. I think it is a little less than a full-time position. In other words, these are not quite full-time positions.

Dr. ANDERSON. Do you remember the B. L. S. study on the earnings of 1,000 railroad employees?¹

Dr. PARMELEE. No; I do not think so.

Dr. ANDERSON. I have a little break-down of it that came to my attention, and I remember that of the thousand employees—I have forgotten his complete controls—Goodrich got 980 railroad men at work in 1932 normally employed railroad workers, and for that group he found 38 percent of them earned less than \$1,000 in that year, 66 percent earned less than \$1,500, and 18 percent earned \$1,750 or better. I wonder if you have any comparable figures, or figures that show something contrary to that for average full-time earnings.

Dr. PARMELEE. I don't know of any special study that has been made in the industry that would compare with or parallel that.

Dr. ANDERSON. You would say that these average compensation figures per employee would give us the average, and a moment ago you said it was very difficult to generalize from an average. I wonder what the median would look like on the same distribution.

Dr. PARMELEE. On that I would suggest that you take the rather detailed studies of the Railroad Retirement Board and work out a

¹ Carter Goodrich, *Earnings and Standards of Living of 1,000 Railway Employees During the Depression*. Bureau of Labor Statistics, Washington, D. C., 1934.

median on the basis of 6-, 8-, 10-month men, men who worked in each 6 months or 8 months or 10 months of the year. My recollection—and I am not quite sure about this—is that the Railroad Retirement Board showed for the year 1937 an average for what you might call the 12-month men of \$1,815, or about \$1,800. The figure here is \$1,781.

Mr. PELLEY. I am afraid the committee may have the wrong impression about the workweek. Of course, the railroads have made some efforts to spread the work as much as they can, but pretty generally now maintenance-of-way men are on a 5-day-week basis. The workweek is ordinarily about 48 hours, but many men work as many as 7 days a week; I think that possibly 48 hours would be about a normal week, or 6 days of 8 hours each, laying off on the seventh day.

Acting Chairman PIKE. Do you take the whole 7 days?

Mr. PELLEY. Generally 6 days a week.

Acting Chairman PIKE. That is still above the figure. You wouldn't get 2,520 hours a year.

Dr. PARMELEE. The committee will recall that the railroads are not under the hour provisions of the wage and hour law.

Mr. HINRICHS. May I suggest that Dr. Parmelee be allowed to insert in the record at this point a brief explanation of what these differences are? Obviously there must be some explanation, partly the statistics technique.

Dr. PARMELEE. What do you mean by differences? I would be very glad to explain how these figures are arrived at in a somewhat more adequate way.

Mr. HINRICHS. A brief interpretation of what that 2,500 figure really means in terms of the average hours that these men work do receive, because no explanation so far seems to fully account for it.

Dr. PARMELEE. I would be very glad to do so if the committee would like to have that done.

Acting Chairman PIKE. I think there should be a sort of explanation there. There are two or three places where there seem to be obvious inconsistencies in the figures as presented, which are probably not inconsistencies at all, but which probably need a little elaboration. I think it would be a very sensible thing to do.

(Senator O'Mahoney resumed the Chair.)

RAILROAD COSTS OF OPERATION

Dr. PARMELEE. "Exhibit No. 2518," shows the unit cost of operation to the railroads in the freight service per 1,000 revenue ton-miles, and in the passenger service per passenger train car-mile.

(The chart referred to was marked "Exhibit No. 2518" and appears on p. 16586. The statistical data on which this chart is based are included in the appendix, on p. 17362.)

Dr. PARMELEE. The table you will notice ends with the year 1938, the latest year for which information was available at the time this booklet was printed. However, knowing that the situation in 1939 was somewhat different than in 1938, and making a special tabulation of some 90 percent of the railroads—that is, railroads handling some 90 percent of the general traffic in 1939—I am able to present to the

committee at this time for 1939 some preliminary figures which are open to some slight possible change in the future. I would like to read into the record the entries for 1939 on this table. Under freight expense total, 6.36; transportation 3.12; under passenger expense total, 0.259; transportation, 0.124. Those lines could easily be extended on to correspond to these figures I have presented.

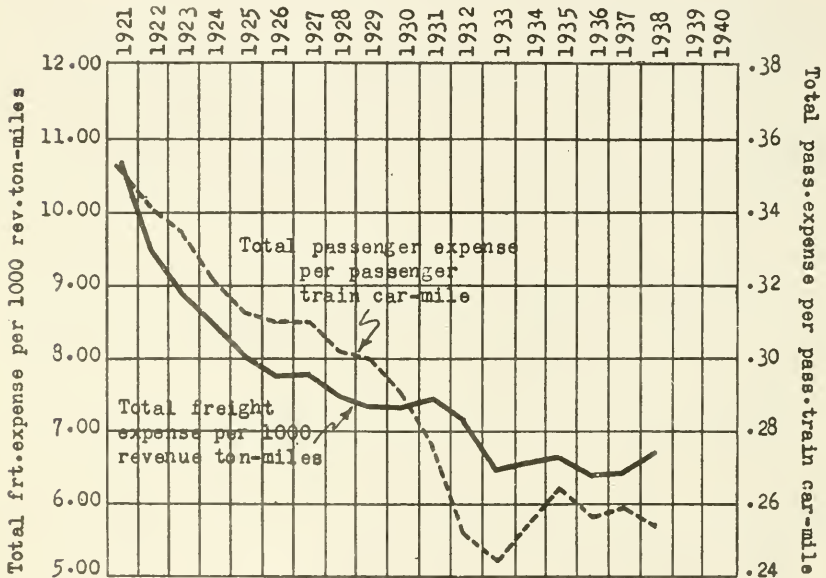
Mr. HINRICHS. In spite of the very substantial increase in hourly rates between 1932 and 1939, the transportation freight expense is about the same as it was in 1933.

Dr. PARMELEE. Slightly less than in 1933; that is right, and that has been brought about very largely, in my opinion, by technology, which is shown in some of the later exhibits in this statement.

EXHIBIT No. 2518

[Submitted by the Association of American Railroads]

UNIT COST OF OPERATION



In Exhibits Nos. 2519 to 2521-A, for example, are shown certain freight-operating averages for the years 1921 to 1939.

(The charts referred to were marked "Exhibits Nos. 2519 to 2521" and appear on pp. 16587, 16588. The statistical data on which these charts are based are marked "Exhibit No. 2521-A" and are included in the appendix on p. 17362.)

Dr. PARMELEE. These five averages or series of averages are by no means all that might have been presented to the committee. They are, however, believed to be fairly representative and significant. They relate to freight-train speed in miles per hour between terminals, and that figure incidentally, of course, includes all delays on the road and all hours spent in intermediate yards representing the actual average.

EXHIBIT No. 2519

[Submitted by the Association of American Railroads]

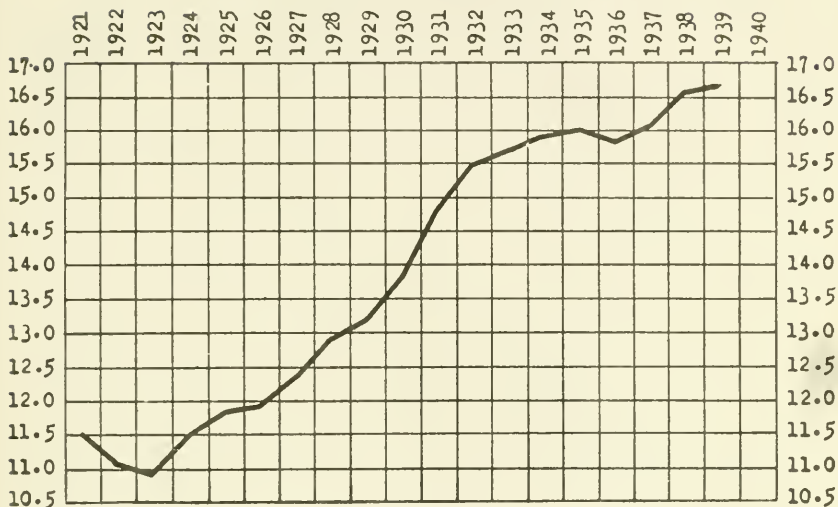
FREIGHT TRAIN SPEED
MILES PER HOUR BETWEEN TERMINALS

EXHIBIT No. 2520

[Submitted by the Association of American Railroads]

FREIGHT CARS PER TRAIN

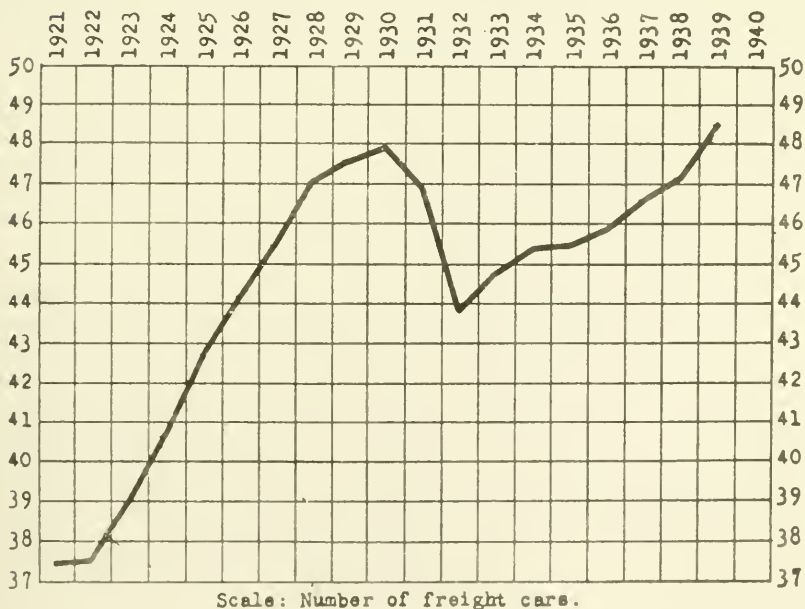
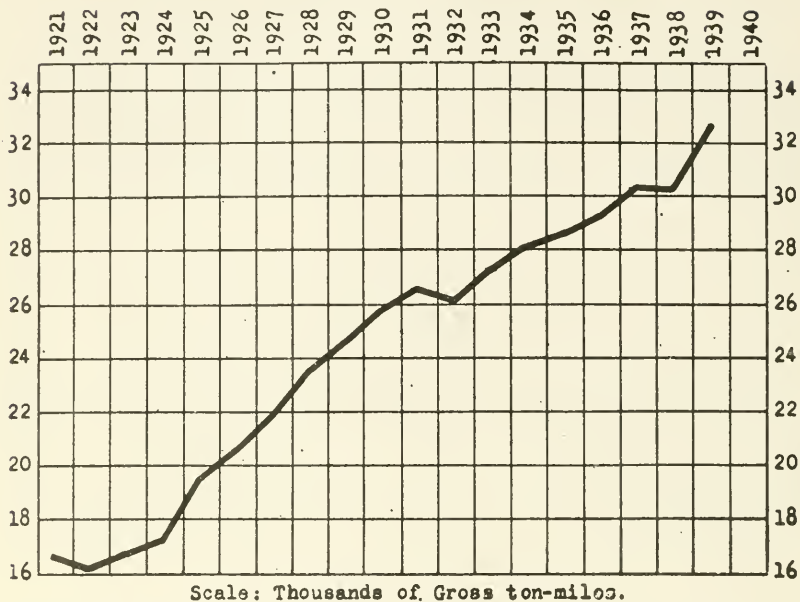


EXHIBIT No. 2521

[Submitted by the Association of American Railroads]

GROSS TON-MILES PER FREIGHT TRAIN-HOUR



The CHAIRMAN. The freight train, according to this exhibit, is moving at a much faster rate than it used to move 10 years ago.

Dr. PARMELEE. That is true, Mr. Chairman. That is the product, generally speaking, of two factors working together; one is actually higher speeds while in motion, and second a very great reduction in the amount of delay between terminals.

The CHAIRMAN. Both those factors are the products of technological advance.

Dr. PARMELEE. Both of them; yes, sir. Delays, for example, may come about through break-downs of equipment. If you have better equipment and take care of it better through technological methods, you have fewer break-downs and fewer delays.

The CHAIRMAN. Of course, the better your equipment the fewer your repair jobs.

Dr. PARMELEE. That is true; and if your track is in better shape that, too, enables you to get along with fewer delays.

Freight cars per train, the average number of cars in the train, also has shown some increase.

Net tons per train; the word "net" in that title means the revenue plus the nonrevenue company freight in the train but does not include the weight of the train. It is the tons of freight, whether revenue-producing or non-revenue-producing.

The CHAIRMAN. These three exhibits portray a striking fact to me; namely, that the general advance of freight-train speed and the general gain of gross ton-miles per freight train-hour proceeded upward without interruption by reason of the depression, but with

respect to freight cars per train, beginning in 1930, coincident with the depression you had a sudden sharp drop for 1931 and 1932. Freight cars per train had reached a peak of 48 in 1930, and a depression low of less than 44 in 1932, but the number of freight cars per train had been constantly increasing since. How would you explain this effect of the depression upon the number of freight cars per train, while it had no effect upon the technological advance which is to be seen in the other two charts?

Dr. PARMELEE. Some of these factors, Mr. Chairman, do have as one of their component elements the volume of the freight handled, there is no question about that, and the factor to which you have called special attention, freight cars per train, does have that element in it. In other words, if your freight traffic demands drop off very suddenly and very precipitously as they did in 1932 and 1933, what it means is that you have to run a certain number of trains in any event, but if there isn't the freight there to handle you reduce the number of cars on the train and to that extent the result is not affected by technology, but by what is called depression.

The CHAIRMAN. Lack of business?

Dr. PARMELEE. It is only, however, in times of very steep and very precipitous decline in traffic that that factor does play a very large part, and that is very well exhibited in this chart to which you have called attention,¹ "Exhibit No. 2520." Now you will notice, if you continue along that same line on that same chart for 1938, we had a rather sharp decline in traffic demand in 1938, and yet your average number of freight cars per train continued to go up. There apparently your operating methods, improved operations, and continually increasing technology, was able to overcome the effect of the decline in traffic and your average kept on going up. I wouldn't draw that analogy too close, but that is what actually happened in that year.

Now the last two columns of the supporting figures,² if I may return to them for a moment, are rather important from the operating man's point of view, although not perhaps so much from the public point of view. A gross ton-miles-per-freight-train-hour is the movement of a gross ton—the tonnage of freight in the train plus the tonnage of the train itself, excluding the locomotive and tender, a distance of 1 mile, and the net ton-miles per freight-train hour, which is the next and last column, is the movement of the total amount of freight in the train a distance of 1 mile, divided by the number of freight-train hours.

Now those two columns, one of which is gross and one is net, are, generally speaking, the product of increased speed of movement, plus increased weight of the train, in one case the total train including the freight, and in the other case the freight in the train.

The CHAIRMAN. That would indicate that the capacity, as reflected gross ton- and net ton-miles, has practically doubled between 1921 and 1940?

Dr. PARMELEE. That is true.

The CHAIRMAN. And that, of course, is strictly technology?

¹ See "Exhibit No. 2520," supra, p. 16587.

² See "Exhibit No. 2521-A," appendix, p. 17362.

Dr. PARMELEE. That is technology almost entirely, I would say, Mr. Chairman, and I call your attention to the fact that every one of these five factors shown here shows a higher or a better figure in 1939 than in any preceding year in railway history.

Mr. HINRICHS. Now the crews and the number of man-hours per train-hour change comparatively from year to year, do they not?

Dr. PARMELEE. I don't know whether that would be true per train-hour; it would be true per trip, of course, but your train-hours may vary per trip from year to year.

Mr. HINRICHS. But you would expect to find if these things had been plotted in terms of man-hours instead of train-hours very similar curves as far as continuity is concerned?

Dr. PARMELEE. That would depend a little, I suppose, on whether you took it in terms of number of men per train-hour, which I think would follow a comparatively even line, or number of man-hours per train-hour, where there might be some change.

Mr. HINRICHS. Well, if the number of men per train-hour is about the same, the hour is the same whether it is for the train or the man, isn't it?

Dr. PARMELEE. Yes; I think you are right, as a mathematical proposition.

MECHANIZATION AND WAGE CHANGES

Mr. HINRICHS. Then I would like to go back to a question which I asked you earlier about the relationship between these technological changes which have been quite marked, and the changes in wages. I shan't attempt to quote you exactly, but in general, if I remember, you said that when there was an increase in wages there was a marked stimulation of efforts to economize in the use of labor. Now I would like you to look at the freight-train speed-miles per hour between terminals or the gross ton-miles per freight-train hour and just reading from the chart, at those places where there was a sudden improvement in technology, tell me where you think some wage changes occurred.

Dr. PARMELEE. Well, I don't think that you can figure it out quite so closely as that. Your changes in employment, of course, apply not only to your transportation men but to your maintenance men as well, maintenance of way and maintenance of equipment. You have three large groups, large general groups of railroad employees who might be affected.

Mr. HINRICHS. That is, with respect to transportation men as one of the three large groups you would be willing to say that the progress from year to year has been remarkably steady and almost independent of any change in wage rates, either up or down. That you ought to be able to read from the chart, shouldn't you, Dr. Parmelee?

Dr. PARMELEE. Yes; it is a fairly steady increase, if that is what you mean; yes. The trouble with most of these lines or trends is that there are so many factors involved in all of them that it is pretty hard to isolate any one. I think you agree with me on that.

Mr. HINRICHS. But there is no evidence in the chart as a superficial exhibit at least of the relationship between wage changes and technical changes that we spoke of earlier?

Dr. PARMELEE. Yes; I think that is true, so far as this particular chart is concerned, which deals with one phase alone of railroad activity and performance.

Now passing on rather hastily—

Dr. ANDERSON (interposing). Just one interruption, Dr. Parmelee. You have been over the Brookings study?¹

Dr. PARMELEE. You mean the book; yes.

Dr. ANDERSON. I would like your comment on the attempt to measure what is called man-hour productivity in the railroad industry last month. Indices of active wages paid divided by index of physical volume, divided by traffic, multiplied by 100 was the method used. Cooperating wages have been used for this computation. The index of wage cost per traffic unit in '38 would have been 38.6 instead of 82.6, so the assumption of the author is that operating wages could have been used as a method of computation.

Now the other method was used, with 1923-25 used as 100. In '30 the index stood at 115; in '35 at 133; in '37, 143; in '38, the end of the series, 144. At no time during the successive years indicated did productivity indices drop. They moved steadily through the depression; they carried out precisely the point you made earlier with respect to these charts. Now, would that be a reasonable observation to make with respect to man-hour productivity in the industry?

Dr. PARMELEE. If I understand your question it is as to whether the productivity per man-hour has been rather steadily increasing?

Dr. ANDERSON. That is right.

Dr. PARMELEE. My answer would be "Yes," but I would like to put in a demurrer, as the lawyers say, on the use of the words "productivity per man-hour." I think probably Dr. Bell uses that phrase in the ordinary accepted meaning, which is not so much productivity per man-hour but output per man-hour, recognizing, of course, that the output is the joint product of several factors working together, not only the efficiency of the individual man but also the efficiency of management, that is, organization, and also the investment in the plant as a whole. I would like to make it clear that that is what I understand by the phrase productivity per man-hour.

"Exhibit No. 2522" appears on page 44, Mr. Chairman.

(The chart referred to was marked "Exhibit 2522" and appears on p. 16592. The statistical data on which this chart is based are included in the appendix on p. 17363.)

Dr. PARMELEE. This shows a very marked increase in full conservation per unit of movement in both freight and passenger service. What interests me in this exhibit is that the gross ton mileage in 1939 per ton of fuel was 17,779. That figure doesn't mean very much, at least to me, until I break it down and divide that figure by 2,000,

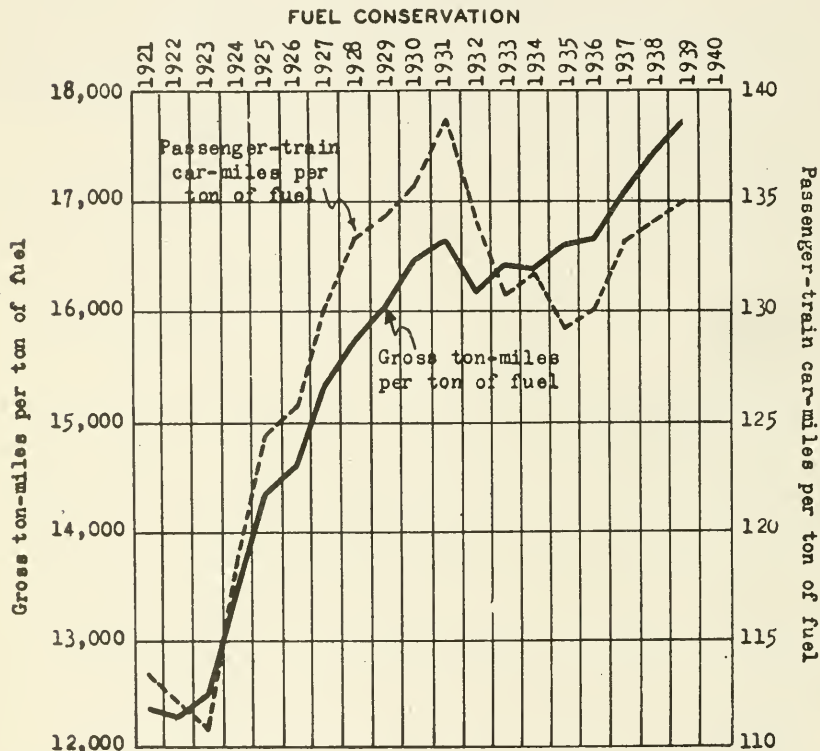
¹ Spurgeon Bell, *Productivity, Wages, and National Income*, Brookings Institute, 1940.

which is the number of pounds in a ton of fuel, from which I discover that on the average in the freight service the railroads moved 8.9 tons of weight 1 mile for the expenditure of 1 pound of coal, or its equivalent, or, carrying it down still further they moved 1 ton of weight 1 mile for the expenditure of 1.8 ounces of coal, a comparatively small piece of coal.

Now since there was considerable increase in that factor from 1921 and the factor again was higher in 1939 than in any other year in history, I think that can be ascribed only to an increase in technology,

EXHIBIT No. 2522

[Submitted by the Association of American Railroads]



better locomotives, better methods of fuel handling and selection, and better actual consumption of the fuel in the locomotive.

I think I can perhaps go over the next four exhibits rather quickly.

(The charts referred to were marked "Exhibits Nos. 2523 to 2526" and appear on pp. 16593-16595. The statistical data on which these charts are based are included in the appendix on pp. 17363-17365.)

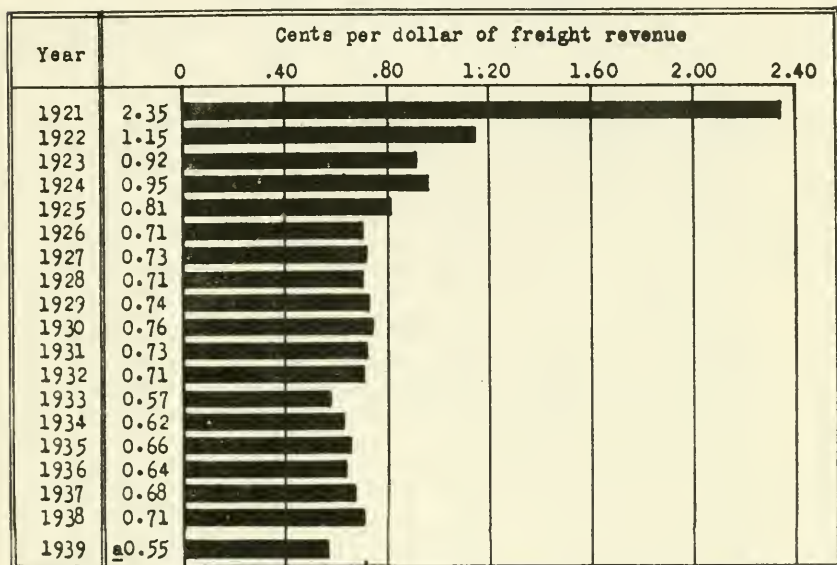
Dr. PARMELEE. They relate mostly to what may be called the various elements of waste, loss, and damage expenses. "Exhibit No. 2523" shows various types of expenditures to make good either a complete

loss of freight or damage to freight, or damage to property, baggage, or what not. You will notice a very marked reduction per dollar of revenue in that factor down to 1939, which is very low. "Exhibits Nos. 2524 and 2525" show a very marked decline in casualty rate of accidents on the railroads. Accidents to employees are shown in "Exhibit No. 2524" and to passengers in "Exhibit No. 2525." In connection with this latter chart, I find in the National Safety Council Bulletin for 1938 this comparison of the casualty rates for fatalities as between railroads, automobiles, and busses, and scheduled air lines. Automobiles and busses refer only to the passengers in the

EXHIBIT No. 2523

[Submitted by the Association of American Railroads]

**LOSS AND DAMAGE EXPENSES
PER DOLLAR OF FREIGHT REVENUE**

a Partially estimated.

* Not yet available.

automobile or the bus, and, of course, the same is true of your air lines.

Now, the death rate per 100,000,000 passenger-miles in 1938 on your scheduled air lines was 4.5.

The CHAIRMAN. From what table are you reading now?

Dr. PARMELEE. I am giving you some figures in the record, Mr. Chairman, from this National Safety Council bulletin. For automobiles and busses combined it was 3.9 deaths per 100,000,000 passenger-miles. For the steam railroads it was 0.36, or less than one-third of 1 for 100,000,000 passenger-miles.

The CHAIRMAN. For what period is this?

Dr. PARMELEE. That was the year 1938, the latest year for which they have published distances.

The CHAIRMAN. The commercial aviation companies have just finished a year without any loss of life at all.

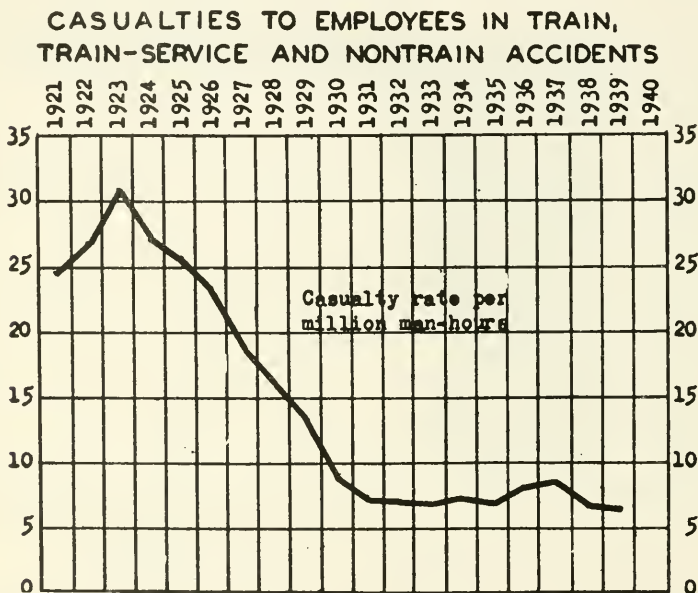
Dr. PARMELEE. That is true, Mr. Chairman; we hope they will keep it up.

"Exhibit No. 2526" is a general bringing together of these loss and damage and injuries to persons expense growing out of handling of freight and baggage and out of casualties to employees and passengers, with a showing of the extent to which that cost per dollar of revenue has been reduced to a comparatively low figure in 1938. Unfortunately, we do not have 1939 figures on that score.

That completes, Mr. Chairman, a very brief analysis of some of the exhibits shown in this statement.

EXHIBIT No. 2524

[Submitted by the Association of American Railroads].



The committee may be interested, however, in considering some of the actual or detailed steps taken by the railways in their maintenance work, in their operations, in their communications field, and others of their activities looking toward this increased technological progress, the results of which are shown quite clearly in this statement.

DETAILS OF LABOR DISPLACEMENT BY MECHANIZATION

Dr. ANDERSON. Mr. Chairman, I wish to introduce at this time, as a file exhibit only, because of its size and character of the exhibit, a very

EXHIBIT No. 2526

[Submitted by the Association of American Railroads]

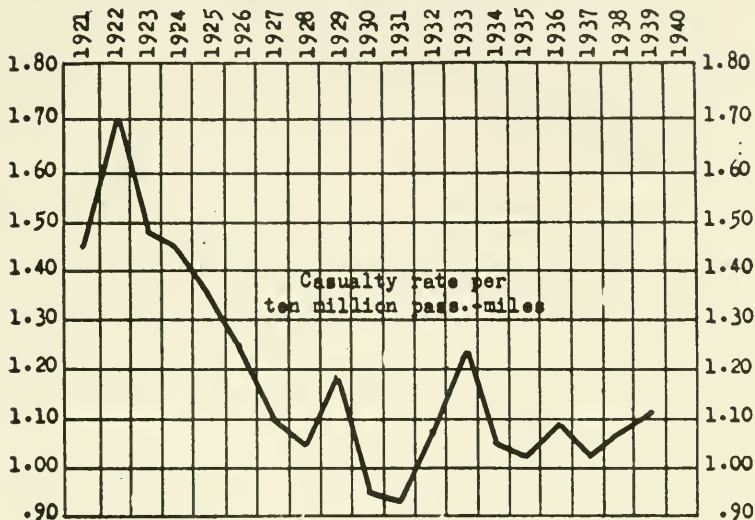
CASUALTIES TO PASSENGERS ON TRAINS IN
TRAIN AND TRAIN-SERVICE ACCIDENTS

EXHIBIT No. 2526

[Submitted by the Brotherhood of Railway Clerks]

TOTAL LOSS AND DAMAGE AND INJURIES TO PERSONS
EXPENSES PER DOLLAR OF TOTAL OPERATING REVENUES

Year	Cents per dollar of Total Operating Revenues								
	Total loss & damage	Injuries to persons	Total	<div> <div></div> Loss & damage <div></div> Injuries to persons </div>					
				0	.5	1.0	1.5	2.0	2.5
1921	1.9	0.6	2.5						
1922	1.0	0.6	1.6						
1923	0.8	0.7	1.5						
1924	0.8	0.7	1.5						
1925	0.8	0.7	1.5						
1926	0.7	0.7	1.4						
1927	0.7	0.7	1.4						
1928	0.6	0.7	1.3						
1929	0.7	0.6	1.3						
1930	0.7	0.7	1.4						
1931	0.7	0.7	1.4						
1932	0.6	0.7	1.3						
1933	0.6	0.6	1.2						
1934	0.6	0.6	1.2						
1935	0.6	0.6	1.2						
1936	0.6	0.6	1.2						
1937	0.7	0.6	1.3						
1938	0.7	0.6	1.3						

important document which has been used by the railroad carriers. It is a brief presented before the Railroad Carrier Industry Committee, under provision of the Fair Labor Standards Act. I want to introduce it here because it is the most graphic portrayal I have seen, a detailed analysis of technological advance in the railroad industry with respect to maintenance of way. Just to illustrate, if you will turn to page 8, you will see portrayed the effects of a portable power track nutter, displayed in the picture on page 9.

(The document referred to was marked "Exhibit No. 2527" and is on file with the committee.)

Dr. ANDERSON. Do you want to continue the discussion, Mr. Parmelee?

Dr. PARMELEE. Yes. May I say, Mr. Chairman, that this exhibit was filed by a trained railroad engineer, the assistant chief engineer of the Pennsylvania Railroad, Mr. Robert Faries, in the recent hearings before the Wage-Hour Industry Committee, which has now under consideration the matter of a minimum wage in the railroad industry. I would like to make it clear first that its presentation here is in no sense an effort to bring that controversy into this committee, and, second, that I am not a technical expert and can discuss these in only the most general way.

Mr. Faries produced in this exhibit before the committee a series of rather illustrative pictures and statistics with respect to certain types of maintenance-of-way machinery, all of which have been introduced on his railroad, the Pennsylvania Railroad, in the last few years, and all the statistics regarding which have been carefully compiled by him from actual tests on the railroad over a period, in some cases, of months, and in some cases, years.

Now, the picture, as Mr. Anderson has said, of the portable power track nutter is shown on page 9 and the statistics at the bottom of that page show how the introduction and use of that machine has saved or curtailed employment.

The CHAIRMAN. Now, of course, a track nutter, for the uninitiated who may read the record, is a machine which screws on the nuts?

Dr. PARMELEE. That is right, Mr. Chairman; you got it right the first time.

Those statistics at the bottom of page 9 are then transferred to page 8 and shown in graphic form. So for the purpose of this very brief statement, perhaps if you will look at the chart on page 8, the picture will be shown there.¹

There are six upright columns on that page, you will notice, three sets of two each. Let us look at the first two of these tall red columns; the heading over the two is "With labor at 30 cents per hour," the minimum wage now statutorily effective in the railroad industry. The first one states that the amount of work done by two of these portable power track nutters in a season's work of 160 days could be done by a foreman and 20 laborers.

The CHAIRMAN. That gang would be working without the machine?

¹ See "Exhibit No. 2528," *infra*, p. 16599.

Dr. PARMELEE. By hand labor. The red part of the column represents the labor cost of that work by hand, The little barred figures at the top are the other things which go into the figure, the pension cost for these men, any amount of repairs on tools, and things of that sort. You will notice at the bottom, at the left, the various items which go into that upper part. Now, if, however, you put two machines to work, you then have the expenditures which are shown in the second column under the general head of "Machine work." Your labor cost, you will notice, the red part of the column, drops very materially. Instead of having a foreman and 20 laborers, you have a foreman, 2 operators, and 12 laborers, a total of 15 men as against 21.

The total wage cost decreases according to the reduction in that red column.

There are certain additional costs which come in because of the use of the machine, and those are shown above the red column in the second column. Some of these are interest on the moneys used to purchase the machines, some of them are repairs on the machines, and some are depreciation of the machines. But the total length of the two columns represents the relative cost of doing this work by hand or by machine.

That there are six men displaced by the two machines is indicated here, and there are \$628 in curtailment of total expenditures.

Now, the machines cost, as shown at the top, \$1,658. They will save \$628 at 30 cents an hour during the working season of 160 days, or they will pay about two-fifths of themselves in the course of a season.

Now if the labor happened to be at a rate of 35 cents an hour instead of 30, the saving on these two machines, instead of \$628, would be \$1,170, whereas with labor at 40 cents an hour, the last two columns on the sheet, the saving would be \$1,713 for the season.

In other words, if wages were 40 cents an hour, those two machines would pay for themselves in the course of a single season.

Now, Mr. Faries showed this same type of information for a large number of machines which I don't need to go into, but the general plan followed throughout was to set up the figures in this form, showing how many men would be displaced and what would be the saving on a given machine, or a set of machines, to do a certain piece of work over a season.

The CHAIRMAN. Mr. Hinrichs suggests we might at least put this single chart in the record.

Dr. ANDERSON. I have been informed, Mr. Chairman, that we can have anywhere up to 10, if you choose, duplicated in the record. There is a variety of them.

The CHAIRMAN. The discussion of this particular chart would be made much more clear if this particular exhibit were in the record. I think it would be well to have it in.

Dr. ANDERSON. That will be "Exhibit No. 2528."

(The chart referred to was marked "Exhibit No. 2528" and appears on p. 16599.)

Dr. PARMELEE. The committee will notice there are a considerable number of machines as to which the same general showing is made, and those are by no means all the machines that might have been shown.

Dr. ANDERSON. Dr. Parmelee—

Dr. PARMELEE (interposing). They are selected as representative.

The CHAIRMAN. How many of them are there?

Dr. PARMELEE. I think Mr. Faries showed here about 20, but I don't know that anyone can answer how many there are in the field.

The CHAIRMAN. But in this booklet from which you were testifying there are about 20 charts illustrating labor displacement by machines of one kind or another.

Dr. PARMELEE. In maintenance-of-way work, only. He was testifying only as to the maintenance-of-way work; that is, work on the track.

Mr. HINRICHs. I don't question for a moment that the chart indicates quite conclusively the reasons for mechanization of this particular operation, but coming back to this question of this relationship between wage rates and the introduction of machinery, this exhibit that you have put here is a fair illustration, I suppose, of that sort of a situation?

Dr. PARMELEE. Yes.

Mr. HINRICHs. Now, as you portrayed it, as I see it, starting with that picture of labor at 30 cents an hour, there is already the possibility of a 33 percent return on an investment in these two machines. An increase in labor cost under those conditions does nothing more than increase the rate of return.

Next you assume a rate of 35 cents, and get essentially a 66 percent return on capital investment. But wouldn't you expect from this record to see the introduction of this machinery, even in the face of a return no greater than 33 percent a year on new capital investment?

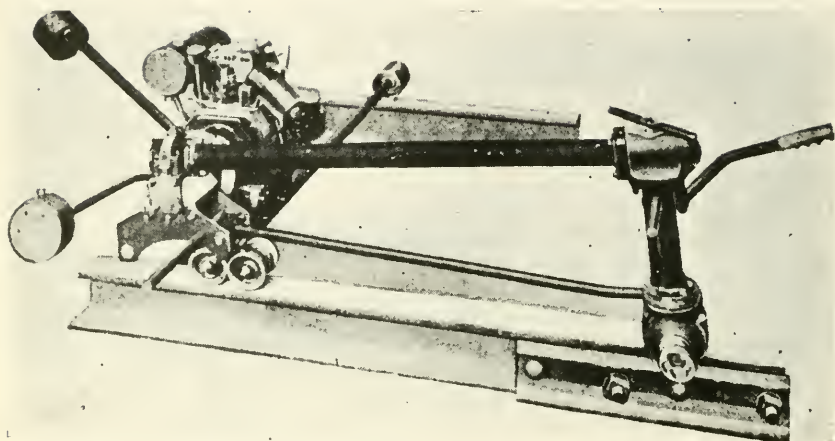
RESISTANCE TO TECHNOLOGICAL CHANGE

Dr. PARMELEE. What you have to consider there, Dr. Hinrichs, is always the element of human inertia working. If you have labor receiving a certain rate, and it has been receiving it for a certain time, and you have a certain number of men on your force, even though you might figure theoretically, as you could from a showing of that kind, that you could get a return of 30 or 40 percent on an investment in machines, you might hesitate to make a change.

However, if you had an increase rather suddenly, and perhaps an enforced increase in your wage up to 35 or 40 cents (I am trying to keep away from this controversy) and that stimulated you to sit down with your pencil and refigure the whole thing, and you found the return was going to be 50 or 60 or 70 percent, instead of 30 or 40, you might then overcome the inertia in your mind and the psychologically strong objection you have in your mind to replacing or displacing your men. There is always that that you have to consider.

Mr. HINRICHs. You don't mean that in order to overcome the inertia of railroad engineers who are advocating a saving of 8 percent

EXHIBIT No. 2528



124491—41—pt. 30 (Face p. 16599)

in the total cost, it is necessary to introduce a 20-percent wage increase, do you?

Dr. PARMELEE. I don't want to use that word "inertia" in a critical sense. I hope I won't be misunderstood on that. I meant the inertia in the minds of all of us when any question of change comes up. We have to be pretty definitely shown that the change will be an economic one, and that it should be made. And when you join with that the very natural and very proper disinclination of a railroad manager to displace men, he will wait a long time before he makes a change. He will try to avoid it if possible.

But if the relative saving from a given introduction of machinery goes up and continues to go up, he finally gets to the point where both inertia and psychological disinclination are overcome, and he makes the change, and the point at which the change comes depends on the circumstance that it is generally believed if you can get a 20-percent return or a little less from a given change, it is a good change. But that does not mean it will always be made at the 20-percent level.

Mr. PIKE. Isn't it true, as near as you can remember it, that an engineer will say, "You get your money back in 4 years," and the manager will say, "Yes, but before I have had it 2 years, you will be in with another gadget that I have got to buy."

Dr. PARMELEE. That may be part of the inertia.

Mr. PIKE. I have seen it in operation. The engineer will come in with a carefully figured saving of substantial size, and if the money is available, which is another thing in railroad management, the thing would without question be introduced. Well, through long and bitter experience, you find that these savings on paper do not always carry through to the actual operation, and the manager is for that reason reluctant to put it in. An additional bit of evidence like this will, however, finally push him over the hill.

Dr. PARMELEE. That is true. All these factors enter into it.

Dr. ANDERSON. Referring to the morning's testimony by Mr. Pelley in which he indicated a marked difference between the problems which the railroad industry is facing today, and those which it faced during the period of over-all great expansion, he pointed out—and I probed him a bit on it—that the problems had changed from one of rapid expansion to one of intensive struggle against the depression and against growing competition.¹

Now, is it your feeling that as a result of this change in the problem confronting the railroads, technology like that mentioned here overcomes more quickly the inertia or the doubt in the minds of railroad managers, and that the engineer now has his way more frequently and more readily than he had in the past?

Dr. PARMELEE. I don't know that I can answer that question in definite terms, because I don't know enough about it. I do know this, that engineers today and railway operators and managers are extremely alert to possibilities, to all the possibilities of increasing and improving the condition of their plant and their operations.

Undoubtedly, there has been some stimulus to them from the depression conditions of the absolute need for economy which has been forced upon them, and there has been some stimulation because they."

¹ Supra, pp. 16537, ff.

had to meet this competition in some way, and improve their service and reduce its cost.

The CHAIRMAN. Dr. Anderson, I wonder if you would turn to page 14 and ask the witness to make a little description of this chart also. It seems to be a rather striking one.

Dr. ANDERSON. I asked him a moment ago; this is much more striking than page 12.

The CHAIRMAN. Would you discuss the burro crane?

(The chart and photograph of the burro crane were marked "Exhibits Nos. 2529 and 2529-A" and facing p. 16600. The statistical data on which the chart is based were marked "Exhibit No. 2529-B" and are included in the appendix on p. 17366.)

Dr. PARMELEE. Yes. The picture of that is on page 15, so I do not think any particular description is needed. You will notice that it does a number of things. It loads and unloads material, it does ditching, and helps out in rail laying, moving rails from place to place, and does a good many things during the working period averaging 180 days a year. The machine costs \$8,023. With labor at 30 cents per hour, the first two columns on the table show that without the crane the amount of work that would be done by a crane and its crew could be done by a foreman and 12 laborers. There would be very little cost of supplies, although there is a small item at the top of that column which represents supplies of various kinds. With the crane and with this investment of \$8,023, the total cost is about cut in half. However, the labor cost is cut by three-fourths, because only 1 man is required on the crane as an engineer and 1 laborer to help him, 2 men instead of 13. You do have an increase in certain other costs, of course, the cost of operating the crane itself, fuel, depreciation, supplies for the machine, and so forth, but even after adding in all of that additional cost you still save about one-half of the cost. There are 11 men displaced, a curtailment of force at the 30-cent rate, and of expenditures of \$3,133, or about 40 percent of the capital cost of the crane; at 35 cents an hour, you would save about 50 percent of the cost of the crane, and at 40 cents an hour about 60 percent.

Mr. PIKE. Any device like this which runs into substantial capital you must put where there would be a good deal of work for it during the year in order to justify it. Here you estimate it is going to be busy half the time.

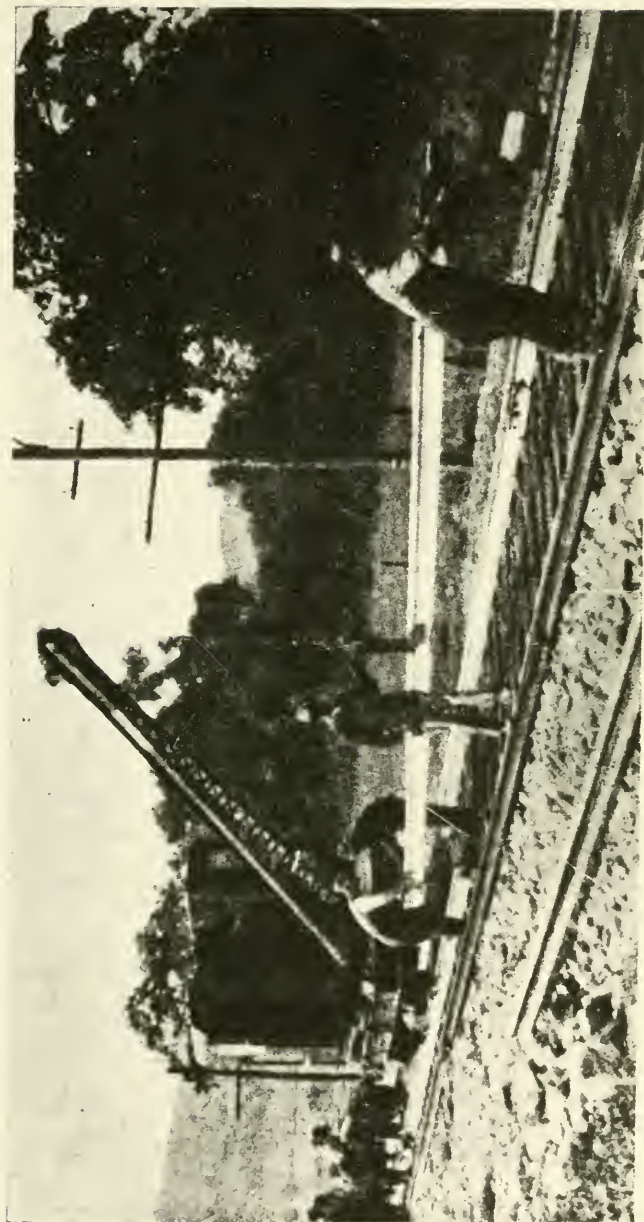
Dr. PARMELEE. About 9 months of the year.

Some of these are sets of machines which cost a considerable amount of money, and some are single machines.

The CHAIRMAN. Would you make any general summary of what all of these exhibits show?

Dr. PARMELEE. Mr. Robert Faries made a summary on page 49 which is perhaps the best place to refer you to. He brought a number of these machines together on a typical railroad with 1,200 miles of main track, and he reached a general summary and average conclusion that an investment of approximately \$600, or \$603 invested in maintenance of way machinery would be equivalent to displacing one man, or, to put it differently, each \$600 invested would dispense with the service of one average track laborer. I was not going through all the details of the table by which he arrived at that, but this is a combination of various exhibits shown earlier in the statement.

Експіт No. 2529-A

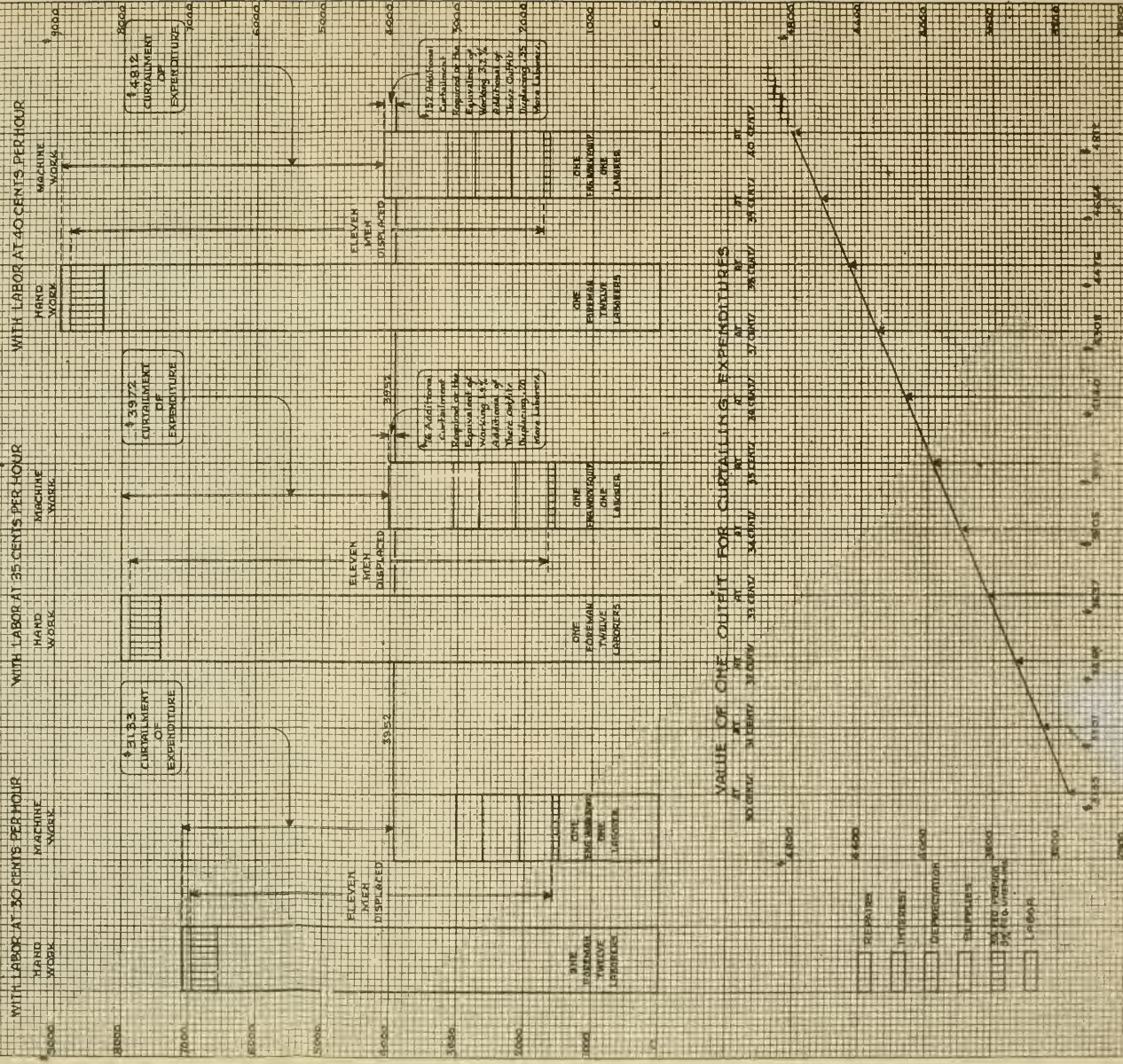


BURRO CRANE

KEUFFEL & ESSER CO. NEW YORK.

CURTALMENT OF FORCE AND EXPENDITURES
THROUGH USE OF 1 MACHINE IN LIEU OF HAND OPERATION
FOR LOADING AND UNLOADING MATERIAL, DITCHING, RAIL LAYING, ETC.,
DURING WORKING PERIOD OF 180 DAYS (9 MONTHS) PER YEAR

FIRST COST OF AN OUTFIT OF 1 MACHINE \$8023
ELEVEN (11) MEN DISPLACED BY USE OF ONE OF THESE OUTFITS



Dr. ANDERSON. A total of 267 men would be displaced by that mechanization.

Dr. PARMELEE. Yes; by this list of 12 or 13 which he has.

The CHAIRMAN. The second column from the end adds up to more than 267 men.

Dr. ANDERSON. Are those net displacements in the second column?

The CHAIRMAN. The second column from the end.

Dr. PARMELEE. I think you are right, Mr. Chairman. I think he reduces that to the equivalent men in terms of one man working a full year. You will notice he says 255 working days per year on a 5-day week basis, but in some cases these men would be working only 60 days in the year, or 52 days in the year, or what not.

The CHAIRMAN. Perhaps it might be well to insert this table in the record.

(The table referred to was marked "Exhibit No. 2530" and is included in the appendix on p. 17367.)

Dr. ANDERSON. Tying our thinking now with respect to these specific examples of displacement to your table 2517, "Employees, Hours, and Compensation,"¹ I wonder if you could give us a break-down of employees, hours, and compensation with the headings that you have in that table, based upon some vertical arrangement of workers or some classification of workers in the railroad industry which would indicate to us workers in the various parts of the industry and their proximity to technological changes. I take it that workers in maintenance of way are particularly close to technological changes indicated by this booklet.

Dr. PARMELEE. Yes; that is true.

Dr. ANDERSON. Is that so true of trainmen, for example?

Dr. PARMELEE. Maintenance-of-equipment men are also fairly close, and transportation men to some extent, but probably not so close.

Mr. PIKE. Station agents and so forth hardly so.

Dr. PARMELEE. Crossing watchmen are affected, and men of that kind. They are in train operation.

Dr. ANDERSON. Is it possible to get a break-down in such classifications as you have been indicating for "Exhibit No. 2517"?

Dr. PARMELEE. I would rather do that by taking the transportation groups and showing it separately for them.

Dr. ANDERSON. Would it be possible to indicate in any specific manner the technological occurrences, with respect to these workers?

SUMMARY OF TECHNOLOGICAL CHANGES

Dr. PARMELEE. I think it would be rather difficult to do that. I would like to do this, Mr. Chairman, if I may: read into the record very briefly some of the things that have been done in these various departments of the railroads as elements of their technological program. This is very much a layman's untechnical summary.

Take the maintenance of equipment—we have talked about that in connection with "Exhibit No. 2528". A few illustrations of the sorts of things that have been done and are being done in technology

¹ See "Exhibit No. 2517," appendix, p. 17361.

in the maintenance of equipment are: Chemical treatment of water supply for locomotives, which has reduced the number of leaking flues and has also reduced the need for washing out of boilers. Both of those, of course, have reduced the number of men employed on those jobs. More recent welding processes are being used for stripping the equipment, for repair and replacement of parts, and for salvaging parts of obsolete and worn-out equipment.

There is a greater and greater use of the oxy-acetylene and electric welding method for specific repair use.

Washing and painting of equipment has been reduced by substituting spraying machines for the hand brush.

The new air brakes which have been recently developed and put into effect, the so-called A. B. brakes, require attention at only 36-month intervals, whereas air brakes of the older types required servicing every 18 months. This reduces the number of times over a given period that the brakes have to go to the shop, and of course the repair work in the maintenance department is reduced.

Scheduling and routing methods are used in handling locomotives and cars through the shops, reducing the time spent on such jobs and very much stimulating and increasing the use of labor-saving devices. Some of the larger shops have adopted the so-called assembly line by which the cars, when being either built or repaired, go through on a track, as in the case of the automobile plants, and are moved through from job to job instead of moved from one shop to another.

In the field of communications and control of trains, there have been very marked technological improvements. I might mention only the installation and development of automatic block-signal systems, automatic train control, development of interlocking plants and remote control, centralized traffic control (a system for manipulating by central control board all main-line-track switches and signals in a given district or even an entire division). The obvious reduction in force required to handle that kind of a system is very clear.

I have presented to the committee some figures which show a very marked increase in fuel economy. A number of factors have contributed to that, such as longer boiler tubes in the locomotives to transfer the heat more efficiently; improvements in the fireboxes which permit better draft and better combustion; the use of superheaters which raise the temperature of the steam and give it greater expansive force; the use of steam separators or so-called desaturators which reduce the moisture in the steam and permit easier superheating; the installation of special heaters which preheat the feed water into the locomotive boiler; and the reduction in the dead weight of locomotives and of cars, which, of course, means that you can handle more weight in the train at quicker speeds with roller bearings at the expenditure of less fuel.

Mr. O'CONNELL. May I interrupt? Is that last improvement you mentioned a prospective improvement?

Dr. PARMELEE. A considerable amount of that is prospective. There has been a considerable increase in the use of aluminum and alloy steel in locomotives, particularly passenger locomotives, and to some extent in passenger cars. It is being experimented with now in connection with the freight cars.

Mr. O'CONNELL. But it is not in very extensive use in either?

Dr. PARMELEE. Not very. There are some experimental freight cars now in service which are being watched and studied with care to decide whether the use of one type of alloy or another type, or one method or another method, is the better. The question of getting the cost down, of course, is an important question at the same time.

In train operation, just to mention a very few, I have spoken of the automatic block signals, interlockers, and so forth. Installation of track scales has been quite general, for the automatic weighing and recording of weights while freight cars are in motion. Devices are in service which use gas, oil, and electricity for melting snow and ice at switches.

A very important improvement in the yards is the so-called hump yard where the cars are classified onto the tracks by being taken to a hump and then sent down an incline by means of gravity. At the same time, in a good many of these yards they have installed so-called car retarders, by which men in the signal tower at a distance can control the movement of these cars from the hump down onto the various classification tracks. A car retarder is nothing more than a brake applied to the wheel of a car from the side, the brake mechanism being installed along the track. The brake is applied to the side of the car wheel as it moves, being controlled from a distance. The introduction of all-steel boxcars and the more general use of all-steel open-top cars; the practical elimination of wood from all of our passenger cars and a large portion of the freight cars has led to greater lightness and fewer repairs.

I have spoken of the introduction of the modern A. B. automatic brake; wrought steel wheels in passenger service; rolled steel; the use of roller bearings which are being put into effect on many of the passenger trains. On the track the drainage methods have been very much improved. There is more and better ballast; heavier rail is being used. The average weight of the rail per yard is going up every year, it is now 94 pounds per yard as against about 87 10 years ago. Larger and better tie plates are being used. There is a great improvement in track fastening, and there has been a gradual replacement of a great many of the wooden bridges and trestles by either creosoting wooden structures or making permanent structures.

Changes in organization, especially in maintenance of way; the tendency is to use large mechanized gangs for maintenance-of-way work; instead of having a small gang scattered at different points over the system, or rather over the division, they have larger gangs and more them more rapidly from one point to another. One thing that has helped in that respect is, of course, being able to move them rapidly by motorcars—power motorcars.

Materials are being conserved to a greater extent than they were. Application of the gas torch and electric arc in the building up of battered rail ends gives longer life of rail and, incidentally, better safety. The application of welding processes in the repair of manganese trackwork; great increase in salvage work by which steel, wood, and other types of materials are brought into central points, are there salvaged, in many cases parts being taken out and reused for other equipment, or in other cases saved and sold as scrap, and reclaimed in that way.

In the accounting department there has been a very marked increase in technology. We do not hear about that, but there is a large reduction in the number of clerks.

Dr. ANDERSON. Do you have the number that has been reduced? Would it be possible to give us a table for our file that would show the effect of technology on clerical workers by grade of workers, type of work done, and displacement?

Dr. PARMELEE. Clerks are classified in three groups, A, B, and C, and I think chief clerks and then stenographers and typists; we can give you those classes, we will be glad to do that.

The CHAIRMAN. The whole story resolves itself into this conclusion: that by reason of the technological advance a great deal more work can be performed with fewer persons.

Dr. PARMELEE. That is exactly what is being done in the railroad service today, Mr. Chairman.

The CHAIRMAN. And of course as the amount of work is increased, if it is increased, then more people relatively will be employed, but the displacement factor is always evident, and that may be overcome only to the degree that new or additional work of some kind or another is created to absorb those who are displaced.

Dr. PARMELEE. You are right, I think, Mr. Chairman. I think there are two things we have to take into account; first, that within limits you can increase your traffic without the necessity of increasing your force, because you are increasing your technological advance all the time. Then there comes a point where even with the improved technology you have to take on more people, you need them. Mr. Pelley spoke of that this morning. Now there is the other feature, and I think we should not omit it from our consideration, and that is that in installing these various machines and power devices, and so on, you are indirectly giving employment to men in other industries. Now that does not help the railway man very much, it is true. It doesn't help him to throw him out of a job if some man who is engaged in building this machinery gets a job, but to look at the picture as a whole that feature is involved.

The CHAIRMAN. The unemployment problem to the man who is displaced is just as acute and just as keen as is the competitive problem to the railroad which finds itself losing business to the waterways or to the highways.

Dr. PARMELEE. Absolutely, and I don't want to give any impression that we don't consider that his position is a very serious one from his point of view, and properly so.

Mr. HINRICHS. Turning to "Exhibit No. 2530", which shows \$603 invested in machinery per man displaced, at least so far as these exhibits of capital invested are concerned, the labor created in the machinery is almost incidental. There is some labor that has been created there, but it certainly is not a very important factor insofar as these exhibits are concerned, is it?

Dr. PARMELEE. Wouldn't you say, Mr. Hinrichs, that the process of producing a machine is made up of labor in the last analysis? Everything produced, in the last analysis, is the product of labor somewhere in some process.

Mr. HINRICHS. I wouldn't grant you that this is entirely labor, but just for the sake of argument, let's assume that this \$603 has

been spent entirely for machine labor. They were making the machines. Labor of that sort would have averaged, would you like to say, 70 cents an hour, or a little more? It divides more easily if we say 60 cents an hour, it makes more labor for you. That is 1,000 hours of labor in these machines (under exaggerated conditions) per man-year of displaced labor. These machines have a useful life, I presume, of anywhere from 4 to 20 years—

Dr. PARMELEE (interposing). You can get that out of the depreciation rate there.

Mr. HINRICHS. The depreciation rate seemed to be relatively low, and to indicate a relatively long life, so that this labor is created in the first year and then does not recur as a matter of course.

The CHAIRMAN. Of course, I think both of you are right; if I may interrupt. There isn't any doubt that the manufacture of this burro crane, of which we had some testimony, is a new industry because 20 years ago there was no such thing as a burro crane, but it is very likely from the picture that that burro crane was not made by hand labor. It was undoubtedly made by machinery, and by hand labor, too.

In modern technology, we have tremendous machines that are needed to make machines, is that not correct?

Dr. PARMELEE. That is correct, Mr. Chairman. I didn't mean to give the impression, if I did, that your labor increase in the machinery-producing industry was exactly equal to the labor displaced on the railway. I don't mean to argue that at all; I simply pointed out there is that factor to be taken into account.

The CHAIRMAN. The problem presented to Government in providing appropriations to take care of the unemployed sort of demonstrates that there is a sum total of labor displacement, though undoubtedly new industries are created and new jobs are made. By and large, when the whole thing is summed up, there is the total unemployment which the Government has to take care of under our present inadequate approach to the subject.

PROSPECTS FOR EMPLOYMENT

Dr. ANDERSON. Mr. Parmelee, might I ask then the question I asked Mr. Pelley this morning? It appears from your own figures that on the upswing of business in the railroad industry, labor, the number of workers, did not increase at the same rate or in proportion to the increased volume of business, and that on the down swing labor displacement was also substantial, indicating that either in good or bad times, the railroad industry seems to have come to the place in its technological development where the number of workers engaged in the industry does not follow in any way with the increasing volume of business.

Now, would it follow from that sort of reasoning that here is a fairly well-established industry with rather rapid technological changes, which cannot, or will not, absorb an adequate number of workers?

Dr. PARMELEE. I don't know that I quite agree with your first premise, Dr. Anderson. Let me put it this way and see if we are on common ground: We have been going through so violent a series of changes in

the last 10 years that it is very hard to generalize and assume that the same thing will go on in the future; it is true, nevertheless, that between 1929 and 1937, if you follow the trend of railroad revenues down—I would rather use revenues than traffic because, after all, the revenues are what you pay your wages out of—if you follow your railway revenues down and then follow your total number of employees down, you find that in every year after 1929 there was a smaller decline in number of employees from 1929 than in revenues.

Or, putting it differently, the decline in revenues was greater than the decline in the number of employees. Now, there was one exception, I believe, to that general rule from 1929 to 1937. From 1937 to 1938 to '39 the reverse was true. Your revenues went up to some extent, up and down both, and your employees in each case went up and down, up less than the revenues and came down a little more. Now that opens up this same controversial question which I prefer not to raise now as to whether this wage increase in 1937 had anything to do with that or not. I would rather leave that question out, but over the last 10 years I think you can say rather generally that the number of employees hasn't gone down in the railroad industry as much as the revenues have declined, and the revenues after all mark the outer limits or boundaries of your pay roll; they are bound to, they must do so. Now, whether that trend will continue as we get back onto a more normal and better economic level it is very difficult to say, but it is true that the minute you get an increase in railroad revenues you will find that there is an increase in the number of employees and an increase in the total pay roll—although not necessarily at the same rate of increase.

Mr. HINRICHS. We take two bites at that question. Exhibit No. 2517¹ showed 1,660,000 employees or more back in 1929. At the present time you are just under 1,000,000. Can you visualize any set of circumstances which within the next, shall we say, decade would produce as much employment on the railroads as you had back in the decade ending in 1929?

Dr. PARMELEE. I hope you are not going to drive me to answer that question, are you?

Mr. HINRICHS. Well, I am not asking you to crystal-gaze, but is there any precedent that you know of in railroad history for an expansion that would give you that level of employment?

Dr. PARMELEE. I would refer you to Mr. Pelley's answer this morning, to a question somewhat similar where he spoke of the possible increase to 1,250,000 or 1,300,000; something of that sort.

Mr. HINRICHS. That is, the limits of employment that you have been talking about are limits a little above a million or a little below a million, depending upon the combination of changes in traffic, revenue, and technology, but the railroad industry appears now to be on a different employment level than it was on a decade ago.

Dr. PARMELEE. It seems to me, Mr. Chairman, that all of these facts that you have been trying to bring out about technology in the past 10 or 15 years in a sense bear on Dr. Hinrich's question. If we went back to 1,600,000 or 1,700,000 in the near future, it would mean that either you would have such a tremendous increase in traffic which would overwhelm the effect of technology and go way beyond

¹ Appendix, p. 17361.

now what seem to be the reasonable boundaries, or else that you were just throwing away the effect of the improvements that you have made.

The CHAIRMAN. Or else that you had overcome the competition from the waterways and motortrucks?

Dr. PARMELEE. That is what I mean when I speak of an overwhelming increase in traffic. It seems to me that question almost answers itself.

Dr. ANDERSON. Mr. Chairman, I wonder if we could ask Mr. Parmelee to state his conclusion on the labor question in terms not only of his own data on revenues and number of employees but in terms of the Brookings Institution data which seem to come to a different conclusion? We would like to have a reconciliation of the two.

The CHAIRMAN. Mr. Hinrichs a moment ago wanted to take two bites. Your testimony is, of course, very interesting and most stimulating, Dr. Parmelee, and I think we really could stay here all night. Do you want him to prepare a statement, Dr. Anderson?

Dr. ANDERSON. I can see him afterward and make arrangements with respect to the data and see that they include Mr. Hinrich's two bites.

The CHAIRMAN. Suppose we compromise on that.

Dr. ANDERSON. The first witness tomorrow, Mr. Chairman, is Mr. George Harrison, president of the Brotherhood of Railway Clerks, to be followed by Mr. A. F. Whitney, president of the Brotherhood of Railroad Trainmen.

The CHAIRMAN. Thank you very much.

Dr. PARMELEE. May I thank you, Mr. Chairman, for your patience and consideration.

The CHAIRMAN. We all enjoyed this. The committee will stand in recess until 10:30.

(Whereupon at 5:50 p. m. a recess was taken until 10:30 a. m. on Tuesday, April 16.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

TUESDAY, APRIL 16, 1940

UNITED STATES SENATE.
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:45 a. m., pursuant to adjournment on Monday, April 15, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman) and King; Representative Williams; Messrs. Lubin, Pike, O'Connell, and Brackett.

Present also: William T. Chantland, Federal Trade Commission, and Dewey Anderson, Economic Consultant to the committee.

The CHAIRMAN. The committee will come to order.

(Representative Williams assumed the chair.)

Acting Chairman WILLIAMS. Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. HARRISON. I do.

TESTIMONY OF GEORGE HARRISON, PRESIDENT, BROTHERHOOD OF RAILWAY CLERKS, CINCINNATI, OHIO

Dr. ANDERSON. Mr. Chairman, today's witness represents railway labor. Mr. George Harrison is president of the Brotherhood of Railway Clerks and he speaks for the Brotherhoods and the Railway Labor Executives Association, some 20 organizations representing considerably in excess of 1,000,000 persons. There will be two labor representatives, Mr. Harrison today, and Mr. Whitney, if time permits.

Mr. HARRISON. Mr. Chairman and honorable members of the committee, at the outset I should like to express my appreciation on behalf of railway labor for the opportunity of appearing before this honorable committee in connection with the technical advance that has been made in railroad transportation and the various results created by that progress. I don't have a prepared statement. I thought perhaps the committee might get more value out of what I want to say if I made a general explanation of the progress that has been made in the industry with particular reference to producing transportation, and for that purpose I have divided the industry into four branches. The first branch that I wish to discuss is that known as the train and engine service, the actual operation of the trains.

TECHNOLOGICAL CHANGE IN RAILROAD OPERATION

Mr. HARRISON. In that portion of railroading, there has been a tremendous improvement since 1920 which has made it possible to reduce the cost of operation, and to improve the service to railroad patrons. It is the opinion of the workers that the tremendous increase in the power and the design of the locomotive was responsible for that improvement. The new type locomotive, constructed of more durable and lasting materials, together with the increased power, has made it possible to haul longer trains and a greater amount of freight in a train.

The reduction of grades affecting the track level and the elimination of curves have been contributing factors in that direction. The efficiency of the locomotive has been greatly increased by the new devices that have recently been applied, such as stokers, oil burners, power reverse gears, superheating of the water, and feed water heaters. The movement of the trains between the terminals has been expedited by the installation of the electric interlocking plants, improved signaling devices, and improved dispatching in issuing of orders because of improvement in telephone communication, repeating telegraph machines and automatic printers.

There has also been an increase in the steam pressure of the locomotive, permitting the exertion of greater power—from about 180 pounds 20 years ago, to 325 pounds at the present time.

The water and coal-carrying facilities of the locomotive, otherwise referred to as the tender, have been greatly enlarged, eliminating operating stops heretofore necessary to take on water and coal.

The locomotives have been equipped with flangers for the purpose of removing snow and ice in the wintertime and bad weather, and the tracks have been cleared recently by the introduction and utilization of rotary snow plows.

Twenty years ago most of our freight trains operated over divisions of approximately 100 miles in length. The locomotive was separated from the train at these division points, taken into the roundhouse and given what we call running repairs, and then returned to take out another train later on. Because of the great improvement in the design and the materials in locomotives, it is now possible to operate a locomotive as much as 1,000 miles without taking it in for ordinary service and running repairs. The theory of automobile lubrication has been applied to the locomotive and that has eliminated much of the necessity theretofore existing for servicing the locomotive every 100 miles.

That gives you a general idea of the improvement in mechanical power. Of course, various new types of power have been introduced in the last 20 years, notably the electric locomotive and the Diesel—electric switching engines, road freight engines as well as road passenger engines. That has had a tremendous effect on the efficiency of the plant by making possible greater speed, shorter schedules, and the elimination of much of the auxiliary or supporting organization ordinarily required to service that character of operation.

In the telegraph and dispatching group, the nerve center that controls the movement or the flow of railroad operations, the most substantial and far-reaching advance has been the installation of centralized train control. It is a device located at a central office which

flashes signals up and down a large area of railroad track, indicating by electric lights when the trains can move and when they shall stop, and generally controlling the movement of the trains. Before the introduction of that tremendously efficient device we had telegraph operators located at stations 5 or 10 miles apart on the railroad line, and a dispatcher in the central office issuing orders to the operators located at those stations who in turn gave the orders to the members of the train crew.

In that connection, the telephone has been utilized for the purpose of increasing the efficiency of operation. Oftentimes members of the train crew will stop at a telephone that is provided out in the country along the right of way, call up the dispatcher and get their orders, and then will set ahead for quite a distance devices known as manual block signaling devices. That, too, has had its effect upon the efficiency of the movement of trains over the railroad.

In the yards where cars are switched, there has been introduced what we call the hump yard. The hump is what the name would seem to imply; it is a hill. They utilize a largeallet type locomotive to push the cars to the top of the hill and then by gravity they run down onto the various branch tracks where they are controlled by what we call a car-retarding device. It is a mechanical contrivance that puts pressure on the inside flange of the car wheels by expansion between tracks and is operated electrically by telegraphers in a tower on top of the hump. That device has greatly improved the breaking up of the trains, classifying the cars into several units of trains, and has resulted in the displacement of a large number of workers.

In addition there have been many consolidations of terminal operations, where two or more railroads agree to combine their terminal operations. That has expedited the movement of freight through the consolidated unit and has displaced a large number of men. Likewise, in passenger-train operation between given points, two or more railroads have pooled their operations, thereby permitting reduction in the number of trains operating between those particular points, with the release of a large amount of equipment and personnel.

Of course, there have been quite a few changes in the office work ordinarily handled by the dispatching and telegraphing forces, but there has been no great mechanical improvement in that direction out on the line of railroad. There has been in another branch of service to which I shall call attention just a little later in my testimony.

MECHANIZATION IN SHOP SERVICE

Mr. HARRISON. Leaving that branch of the industry and going to what we would call the garage or the shop service, where the mechanics maintain and build the rolling stock, both locomotives and cars, we think the greatest advance in that direction has been the new type of machinery that has been installed in the shops.

In that connection I would call attention to the multiple planer where they can now dress 15 or 20 locomotive side rods at one operation while 20 years ago they could only machine one locomotive side rod, and they have applied the principle underlying the huge planer to the drill presses, tapping machines, and threading machines. They have introduced mechanical forging machines where locomotives and car parts made out of steel and wrought iron can be heated and put

into a machine equipped with dies. They were all forged by hand 20 years ago with little exception.

The introduction of the steel car and the combination steel-wood car, has resulted, of course, in the elimination of much maintenance and has increased the life of the vehicle or the unit tremendously.

Many of the steel cars are made of rust-resisting steel, and this has eliminated much of the servicing and painting and also prolonged the life of the car.

The new-type locomotive, as I have indicated, requires less servicing and lasts longer, and consequently it needs less servicing in the shops.

Our mechanical craft representatives say that the most substantial change in that direction has been the advance in the treating of the water used in the locomotive boiler, eliminating much of the scale and corrosion formerly occurring on the tubes and the lining of the boiler, and the introduction of roller bearings, together with the new type of lubrication, as I mentioned a moment ago.

That represents in a general way the progress made in the shops.

Now, along the line of railroad, what we call the right-of-way or the maintenance-of-way department, we are of the opinion that the greatest advance in that direction has been the introduction of the 130-pound, 39-foot rail in substitution for lighter weights and shorter lengths, assisted with rock ballast in place of cinder and other types of ballast, and treated railroad ties.

There are no exact figures available on the life of a treated tie; we have not had enough experience to learn what that is. From the best information we think it is about 21 years as compared to a period of 7 or 8 years for an untreated wood tie.

In the last 20 years there has been a tremendous shift from the untreated wood tie to the treated wood tie. When we reflect there are about 3,000 ties to every mile of track, we get some idea of the tremendous effect of the treated tie upon the maintenance of the right-of-way, and all that that implies in the way of expense and labor.

Likewise, the introduction of electric crossing signaling devices has had the effect on the movement of trains as well as employment of labor.

The elimination of grade crossings has displaced crossing watchmen. Then at operating points along the road, automatic water facilities have been introduced, operating on the same theory as our automatic refrigeration. It is controlled by the level of the water in the tank. In the old days, we had the pumper, operating a steam engine, pumping water out of the wells into the tank. The coal chute facilities and cinder pits have also been greatly improved.

In the old days, the coal was elevated on a trestle. Now it is conveyed mechanically to the coal chute. The cinders were formerly taken out of the pit by hand, and now are taken out by hopper conveyors and loaded into the car at the same operation.

The tool introduced in the maintenance-of-way work, or the servicing of the track, that represents the greatest progress might be said to be the ballast cleaning machine, which eliminates cinders and dirt and other substances that get into the ballast and make it mushy.

Every so often, ballast has to be cleaned, and that material removed in order to have a proper foundation under your track.

In the old days, when there was a low joint in a track where the track comes together, the pounding of the drivers of the locomotive on that joint would cause the end of it to wear down, and we would be required to remove that piece of track, cut it off with a hand hack saw, drill several holes in it, and replace it.

Now we have several types of welding machines, and we just dress it up and weld a piece on it, and the joint is as good as it ever was. This has eliminated a huge amount of labor and has meant a saving of a large amount of material.

We have weed-burning machines that clear the right of way. We have ditching machines that dig the ditches alongside the railroad tracks so the water will run off and create proper drainage. We have air-tamping machines that tamp the ballast between the ties. That was done by hand 20 years ago. We now have air-operated drills and mechanical equipment to load and unload ties and rails. That has represented a tremendous increase in efficiency, together with elimination of a large amount of personnel.

Turning now to my own branch of the service, which is the clerical branch, there has been tremendous progress made in that field by the introduction of almost every type of office equipment device: the typewriter, the calculating machine, the key punching machine, the bookkeeping machine, all of which have brought about the unification of the work at a central point.

The machine could not be utilized under the old method. When the machine was introduced it was necessary to centralize the work, and so the work has been removed from many offices along the railroad line and consolidated and centralized in, ordinarily, the headquarters or general office building of the railroad.

The consolidation of railroads has represented a tremendous advance in the elimination of personnel, and made possible the introduction of machinery. We cannot give you any precise figures that could be relied upon as to the cost of that machinery or the displacement of the labor, because there are so many contributing elements and influences; but the displacement has been tremendous. I shall give you some exact figures on the number of employment opportunities that have been eliminated as a result of the great progress that has been made in the industry.

Along with the utilization of all of these now mechanical devices to which I have referred, there has been a tremendous increase in the efficiency of the average worker. Our employment is pretty much stabilized because of the rules and regulations in the union contracts, and as our men grow older in the service, of course, they become more efficient in the performance of their several tasks. With the machine and the man I would say that there has been a tremendous advance in the railroad industry in the way of utilizing the new devices that have developed over that period of 20 years. So that you may have some general information on the industry in addition to what Dr. Parmelee presented yesterday—he put in the record a large number of exhibits and I don't wish to duplicate them because I can agree with most of them and the few that I find I am in conflict with him about I shall take up individually if the committee will permit—there are some matters on which he did not give statistical information that I thought might perhaps be of value to the committee. So if I may be permitted at this time I

would like to introduce Exhibit 2531, showing the outstanding par value of the stocks and bonds of the industry, so that you might have an idea of the general interest of the public, their stake, as one would put it, in this great railroad transportation industry.

Acting Chairman WILLIAMS. It may be admitted.

(The table referred to was marked "Exhibit No. 2531" and is included in the appendix on p. 17367.)

Mr. HARRISON. There are outstanding at par value \$8,148,602,000 of stocks and \$9,934,666,000 of bonds, or a total outstanding capital in the hands of the public of \$18,000,000,000.

Mr. PIKE. This eliminates intercompany ownership?

Mr. HARRISON. Yes; it eliminates intercompany holdings. This is the stock and bonds in the hands of the general public.

Mr. PIKE. And includes receivership roads?

Mr. HARRISON. Yes; it does. The 1938 figure reflects a slight reduction in the bonds. You will notice there is probably some adjustment there as a result of that, but very slight.

I would like to introduce Exhibit No. 2532, Investment in Road and Equipment, Class I Railways and their Lessor Companies.

Acting Chairman WILLIAMS. Let me inquire as to all of these exhibits that you offer. The source of the figures presented by the exhibit is given on the exhibit?

Mr. HARRISON. Yes; on the exhibit.

Acting Chairman WILLIAMS. As to all of them?

Mr. HARRISON. The source is an accepted authority, the Interstate Commerce Commission, in the instance shown on the exhibit.

Acting Chairman WILLIAMS. It may be received.

(The table referred to was marked "Exhibit No. 2532" and is included in the appendix on p. 17368.)

RAILWAY EXPENDITURES FOR NEW LINES AND EXTENSIONS

Mr. HARRISON. The exhibit now before us indicates the expenditures of all class I railways and their lessor companies for new lines and extensions, by years from 1921 to 1938. In the second column is shown the expenditures for additions and betterments by years, 1921 to 1938, totaling \$9,649,385,414. That might be said to represent the gross investment that was made by the railroads through that period of 19 years for technological improvements. There is credited against that approximately \$4,500,000 for property retired, but the fact remains that about \$9,500,000,000 was expended for the purchase of better facilities to carry on transportation, and under the accounting rules of the Commission they are lumped under the general heading of expenditures for additions and betterments.

Mr. O'CONNELL. May I ask a question there? Comparing the two charts, the second one indicates a total net investment of over \$5,000,000,000 during this period, and the other indicates an increase in total capital outstanding of only about a billion dollars over this period. Would that indicate that most of that \$5,000,000,000 was financed out of earnings, depreciation reserves, and that sort of thing rather than new capital?

Mr. HARRISON. That is true. It is the view of railroad labor, with which our railroad management friends don't agree, that prior to 1921 there was a large volume of water in that capital and some of

it has been squeezed out by this process, by putting in and plowing back the earnings.

Mr. PIKE. It might be interesting there, if you have any idea, Mr. HARRISON, what the market value of that \$18,000,000,000 is. I don't think it is in the exhibit.

Mr. HARRISON. No.

Mr. PIKE. I wonder what the present estimate is.

Mr. HARRISON. I don't know what today's figure would be, but my recollection is that it is just about one-half of that total—you could buy it on the market for that.

Mr. PIKE. A round amount of \$10,000,000,000, probably.

Mr. HARRISON. Yes.

Acting Chairman WILLIAMS. That would represent in round numbers the value of the bonds outstanding.

Mr. HARRISON. And the stock.

Acting Chairman WILLIAMS. Half would represent just about the value of the bonds.

Mr. HARRISON. I beg your pardon. I didn't understand your question.

Acting Chairman WILLIAMS. The market value today would just about represent the value, I assume, that is, the par value of the bonds outstanding.

Mr. HARRISON. That is right. I didn't understand the question; I am sorry.

I should like to introduce an exhibit showing the number and tractive effort of steam locomotives by years, '21 to '38.

Acting Chairman WILLIAMS. It may be received.

(The table referred to was marked "Exhibit No. 2533" and is included in the appendix on p. 17368.)

Dr. LUBIN. For the purpose of the record will you explain just what is meant by tractive effort?

Mr. HARRISON. That is a very involved matter. I looked it up last night because I didn't know myself.

According to the method used by the I. C. C., the tractive effort of a locomotive is determined by taking the diameter of the cylinder squared, multiply it by the length in inches of the stroke of the piston, multiply it by 85 percent of the boiler pressure per square inch and divide by the number of inches in the diameter of a driving wheel, and that gives you the tractive effort exerted at the rim of the driving wheel.

Acting Chairman WILLIAMS. In plain words does that mean the engine power?

Mr. HARRISON. It means the pulling power of the locomotive; yes.

Acting Chairman WILLIAMS. It simply means the power of the engine.

Mr. HARRISON. That is right, the pulling power of the locomotive.

Mr. O'CONNELL. I note by this exhibit that the number of locomotives during the period decreased from 64,000 to 42,000, and the average tractive effort increased from 36,000-plus to 49,000-plus. Does that increase necessarily represent technological improvement in the locomotive or is it in part explained by a retirement of locomotives with a lower-than-average tractive effort?

Mr. HARRISON. There is a combination of elements in these figures; Senator.

Mr. O'CONNELL. Thank you.

Mr. HARRISON. Many of the smaller types of locomotives have been retired, and of course a number of new and powerful locomotives have been introduced. What the exact figure would show in segregating the two elements I don't know, but there are today 42,000, as you point out, against 64,000 locomotives, with a much larger tractive effort, 13,000 pounds.

Mr. PIKE. Mr. Harrison, Mr. Parmelee yesterday had a few figures on about the same thing only he carried it forward 1 more year, and it shows that the tractive power in 1939 was slightly larger than the total tractive power in 1916.¹ As I remember it, in '16 it was 2,030,614,416, and in 1939 it was 2,153,000,000. There was a slight increase in total tractive power or tractive effort, whichever is the proper term.

Dr. ANDERSON. The total tractive power does not appear in the exhibit.

Mr. PIKE. But you can get it by multiplying the two, and it slightly increased for the period.

Mr. HARRISON. Yes; Dr. Parmelee used 1916. That is a very favorite—

Mr. PIKE (interposing). It would show a slight decrease from '21, which was 2,398,891,315.

Mr. HARRISON. That is true. Since the coming of the depression at the end of '29, you see, there has been an increase from 44,000 average to 49,000, recognizing, of course, the influence of the two elements of obsolescence and improved type of machinery.

Mr. PIKE. A combination of the two.

Mr. HARRISON. Yes.

I should like to introduce "Exhibit No. 2534," which is very much the same as "Exhibit No. 2533," but dividing the types of locomotives as between passenger and freight. It shows relatively the same change as indicated by the previous exhibit.

Acting Chairman WILLIAMS. This may be received, and I may say without repeating, that all these exhibits offered may be received for the record.

(The table referred to was marked "Exhibit No. 2534" and is included in the appendix on p. 17369.)

INCREASED EFFICIENCY OF ENGINES

Mr. HARRISON. The next exhibit discloses the amount of fuel consumed in freight and passenger service, commencing with the year 1921, calculated on 1,000 gross ton-miles freight service, and the passenger-train car-mile.

The table referred to was marked "Exhibit No. 2535" and is included in the appendix on p. 17369.)

Mr. HARRISON. In 1921, the exhibit discloses, it required 162 pounds of coal to move 1,000 gross tons of freight 1 mile—that is, freight and equipment—and it required 17.7 pounds of coal per passenger car-mile. In 1939, in the freight service, it had declined to 112 pounds, or exactly 50 pounds per 1,000 ton-miles, and for every passenger car moving 1 mile it had declined about 3 pounds. I haven't calculated the gross effect of that saving on tonnage of coal and coal miners, but

¹ See "Exhibit No. 2493," appendix, p. 17351.

it is tremendous. It results from better utilization of fuel, better fireboxes, better combustion, better utilization of the equipment and fuel by the firemen and the engineer to a greater degree of efficiency in operation.

The next exhibit indicates the number of passenger and freight cars installed and retired, and it shows pretty much the same story as the locomotive exhibit discloses, retirement of light, small-capacity equipment and the substitution of large, heavier-capacity cars.

(The table referred to was marked "Exhibit No. 2536" and is included in the appendix on p. 17370.)

Mr. HARRISON. The average of these cars in freight service is disclosed by the following exhibit.

(The table referred to is marked "Exhibit No. 2537" and is included in the appendix on p. 17370.)

Mr. HARRISON. In 1921 the average tonnage of the freight car was 42.5, and in 1938 it had increased to 49.4 tons. That has had a tremendous effect, of course, in releasing equipment and personnel and improving the efficiency of operation.

Mr. PIKE. On that I would like to ask you a question which may be way off your beat, but I notice in recent years the freight-car capacity was, say, 100,000 pounds, load limit, 121,000 pounds. I don't know when that came in, but it seems to be fairly recent. What is the practical capacity of that 100,000-pound car? What do they load it to?

Mr. HARRISON. Oh, taking the general type of freight, it is infrequent that we get the capacity of the car.

Mr. PIKE. It is usually the bulk?

Mr. HARRISON. Generally we get about half the car capacity. Now there are figures available; I suppose Dr. Parmelee could tell you the average load.

Dr. J. H. PARMELEE (Bureau of Railway Economics, Association of American Railroads, Washington, D. C.). The average carload last year was 36.5 tons, the average carload of carload traffic, which is about three-fourths of the average capacity of the car, and that is the highest average, by the way, that has ever been attained in the railroad industry.

Mr. HARRISON. Taking all traffic, less than carload as well as carload, what does it run?

Dr. PARMELEE. That we have no figures on. The average load of l. c. l. cars is around five.

Mr. PIKE. Isn't it almost always true except in handling products of mines that the bulk of the freight rather than the weight will limit what a car can carry?

Dr. PARMELEE. Oh, I think so; in bulk movement or in bulk loading you practically load to capacity at all times.

Mr. PIKE. So if you gave the car capacity in cubic feet rather than pounds it would perhaps be a more accurate index for general freight?

Dr. PARMELEE. Really, I don't know what the answer is to that subject.

Mr. PIKE. Well, I shouldn't have brought it up.

Mr. HARRISON. I don't think so, because a railroad car is like any other structure; if you overload it, it will break down. The capacity of the car is generally rated from the diameter of the axle on which the load rests. A $5\frac{1}{4}$ by 9 by 8 journal is an 80,000-capacity car, and

a 5½ by 10 journal is a 100,000-capacity car. This is a little side line. I used to work in the shops myself, but it has been so long ago.

Dr. ANDERSON. With respect to "Exhibit No. 2537," is there any noticeable acceleration in rate of increase of average capacity from '21 on? Is there anything to indicate that that movement is increasing as technological change increases?

Mr. HARRISON. Yes; the general policy being followed by the railroad is to retire the small-capacity car, because most of those cars are of the old wooden type, you see. The newer-type cars are of larger capacity and of steel construction. I would say there has been a very rapid abandonment of the lightweight wooden, low-capacity car and the substitution of the combination steel-wood and all-steel car of larger capacity. That is one place where we and our railroad management friends disagree. Railroad labor believes that we are headed in the wrong direction, that we ought to put small, lightweight, more frequent units of operation in service to meet this new transportation problem. The railroads for the last 20 years have gone to the slow, large, heavy equipment, and it is just not flexible enough to meet present-day transportation needs, and therefore we are losing in the race of competition. We don't wish to substitute our judgment for theirs. I don't know who is right; but as men who do the work, that is our opinion about it.

Dr. ANDERSON. Well, they are motivated by meeting competition, according to the testimony yesterday. Why wouldn't they see this as preferable?

SPEED OF RAILROAD TRANSPORTATION

Mr. HARRISON. Well, I don't want to be critical, I don't know that I have the answer to it, but if you take it for what it might be worth, we still have today managing and directing the operations of the railroads officials who came in 20 years ago, and they were schooled in this heavy power age and they just can't be convinced that this new idea about it is the solution. As I say, we who do the work believe it is, and on that question it perhaps is of some importance here to say that through the period of the depression when the volume of traffic declined, it was very clear you couldn't operate these heavier types of equipment economically, consequently you held the freight until enough accumulated to make the tonnage that would permit the operation of this heavy, expensive equipment. Therefore we have a tremendous delay in servicing the public, all in order to get the proper tonnage to start the train on its destination.

Mr. PIKE. You can't generalize too thoroughly on that, can you?

Mr. HARRISON. No; you can't generalize too thoroughly on it, but if you will look at Dr. Parmelee's exhibit of yesterday showing the increased speed of trains between terminals, you will see how hopeless we are in that race.

Mr. PIKE. About eleven-something to sixteen-something.

Mr. HARRISON. On the average, 16 miles between terminals. Of course, that doesn't mean from the time we got the shipment until we delivered it. My recollection of that figure is that it is about 5 or 6 miles an hour from the time we get it until the time we turn it over at destination. Now, that is caused by many of these elements, not entirely so.

Mr. PIKE. Of course, in that you have to take products of mines that make up so much of the bulk of the railroads, and usually there isn't any terrific hurry to get it to destination.

Mr. HARRISON. Yes; but the products of mines generally move pretty rapidly. Take the ore trains up in the iron range; an engine will take 135 of those ore cars at the mine, and they are down that hill before you can say "Jack Robinson." It moves in a hurry because it is high grade, very remunerative traffic. Generally there is a boat in that needs a particular type of ore for the mill or needs a particular type of ore to mix with other types of ore that the mill needs, and it moves pretty much on schedule.

I don't want to be misunderstood in trying to substitute my judgment for the operating management of the roads, but that is our view as workers, and this is our day to tell our story, and it goes for what it is worth, I guess.

I should like to submit "Exhibit No. 2538."

(The table referred to was marked "Exhibit No. 2538" and is included in the appendix on p. 17371.)

Mr. HARRISON. The next table gives expenditures for small tools and supplies and machines by Class I railroads from 1910 to 1938.

(The table referred to was marked "Exhibit No. 2539" and is included in the appendix on p. 17371.)

Mr. HARRISON. You will note prior to 1919 the expenditures averaged about \$4,000,000 a year and then jumped up about $2\frac{1}{2}$ times, to around \$11,000,000. During that period, 1920 to 1929, \$110,000,000 was spent for small tools and supplies and \$63,000,000 for roadway machines. That represents the equipment around the shops and on sections, servicing the tracks and the rolling stock.

I want to call your attention to "Exhibit No. 2540."

Dr. ANDERSON. One moment first; with respect to "Exhibit No. 2539," you have presented here just money figures. I presume an adjustment for price changes would accentuate this increase for machinery, would it not?

Mr. HARRISON. Well, I presume if prices declined there would be a larger number of units purchased. On the other hand, if prices increased I presume a lesser number of units would be purchased.

Dr. ANDERSON. Have you made the adjustment for price changes?

Mr. HARRISON. No; this represents actual dollars spent. I don't know anything about what the influence might be if we considered changes in price levels, but the real influence in these figures is the ability of the railroad to buy. Just like the average individual, if you have lots of money it doesn't matter if you spend more. If you are poverty-stricken you pull up a notch and spend less.

Mr. O'CONNELL. I notice, in the exhibit to which Dr. Anderson just referred, the relative decline in the thirties in the purchase of small units and supplies is substantially greater than for roadway machines. Are roadway machines, generally speaking, labor-saving machines?

Mr. HARRISON. Yes; they save a tremendous amount of labor.

Mr. O'CONNELL. That would explain to an extent at least the fact that in that area the decline was not great.

Mr. HARRISON. I think perhaps that is true. The machinery introduced along the right-of-way for maintaining the section has had a tremendous effect in displacing labor.

On that point, I have an exhibit used in the wage-and-hour hearing which gives the effect of mechanizing a typical railroad.

Mr. PIKE. We had that yesterday afternoon and that is in the record.

Senator KING. There seems to be a relation, if I properly interpret "Exhibit No. 2539," between the expenditure for small tools and supplies and for roadway machines, if you run down those two columns; indeed, there seems to be a larger expenditure for roadway machines in 1935 or 1934.

Mr. HARRISON. Yes; that is true, Senator; although the relationship did disappear to a large extent in some of the latter years. Of course, there are a number of elements that influence that. The maintenance engineer submits his recommendations for the purchase of machinery; maybe he can talk a little faster than the mechanical engineer in charge of the shops; maybe he will get the authority and the other fellow won't. There are a hundred and one influences there; maybe one man is a little better salesman than the other and he can sell his machine.

Dr. ANDERSON. It would appear, Mr. Harrison, following Senator King's remark, and Mr. Pelley's statement yesterday, that the problems of the railroad are now problems of meeting severe competition, that since 1931 the relationship between small tools and supplies and road machines has changed as compared with the earlier years to a point where now about the same amount, with one or two exceptions, is spent for road machines as for small tools and supplies.

Mr. HARRISON. That is right.

Dr. ANDERSON. Would that indicate a relatively greater dependence upon road machines, which are labor-displacing, than upon small tools and supplies, which are labor-saving?

Mr. HARRISON. Well, I think perhaps the greatest opportunity for economies does lie in the utilization of maintenance-of-way machinery rather than in the small tools and supplies.

Senator KING. I presume that the cost of maintaining the road in good shape varies from year to year, does it not?

Mr. HARRISON. Well, there are a number of factors there, Senator; the volume of traffic, the financial ability of the particular railroad company, and the type of roadway and the territory. You take the low mountain country and the damp country—there are a lot of influences there.

I have some figures indicating in a general way the variations in that connection, and I shall come to them in a later exhibit.

Senator KING. My observation is that the situation is much like that of a man with an automobile; he uses the machine as long as he possibly can, as long as the automobile renders rather effective service, and then he all at once buys a new machine. So the expenditures for railroad track and improvements will not have a uniform curve.

Mr. HARRISON. No. You take some of the railroads that are in good financial shape, and if you took a look at their right-of-way, they have heavy 130-pound steel, good rock ballast, their bridges and buildings are all painted, and they look in good shape.

On some other railroads that are one jump ahead of the sheriff, if they are about to go bankrupt, their track is very rough, the ballast is bad, the buildings look as if they had been abandoned.

But, generally speaking, they do keep the track in very good shape and in very safe condition.

Mr. PIKE. You will note, though, Mr. Harrison, that once they get safely into the arms of the sheriff, they begin to build up.

Senator KING. They do?

Mr. PIKE. Almost always.

Mr. HARRISON. Well, what happens generally, as we have observed it, is this: when they cease paying the interest on their bonds, during the period of trusteeship or receivership, they spend their money to improve their physical property.

Mr. PIKE. That is exactly what I had in mind.

Mr. HARRISON. If you look at a road that is in receivership or trusteeship, a road that is making money above operating expenses, you will see a railroad in good shape physically. That, of course, increases the equity of the security holder generally. That represented the new stock which in the old days was floated in place of the stock that had been washed out in receivership, but the Commission has changed that.

"Exhibit No. 2540" covers the total number of employees, total number of hours worked, and total compensation for class I carriers.

(The table referred to was marked "Exhibit No. 2540" and is included in the appendix on p. 17372.)

DECLINE IN JOB OPPORTUNITIES

Mr. HARRISON. This table discloses that in 1920 we had 2,220,832 full opportunity jobs, while today, or in 1939, last year, we only had 987,943.

Acting Chairman WILLIAMS. Will you explain what you mean by full opportunity jobs?

Mr. HARRISON. Under the regulations of the Interstate Commerce Commission, in reporting the number of employees to the Commission you are required to report the number of jobs that are considered regular jobs that are in existence at the middle of the month, excluding part-time or seasonal workers.

These are presumed to be regular, steady jobs, eliminating all part-time or seasonal workers. At the middle of the month the number of jobs are counted on every railroad in the country, and the regular jobs are segregated, and that number is reported as full-opportunity jobs at the middle of the month.

Now, we take those reports for the 12 months, add them together, and divide them by 12, and that gives us the average number through the year which is the number used in this exhibit.

Senator KING. It is sort of a weighted average?

Mr. HARRISON. It is a weighted average of full opportunity jobs. It excludes the seasonal and part-time jobs.

Senator KING. The sum total would bring your total—if you included your seasonal and part-time jobs—slightly above the 2,220,832, would it not?

Mr. HARRISON. Yes. In 1939 full-opportunity jobs in the service of class I railroads numbered 987,943, while there were actually employed during that year 1,325,973 different persons. The difference is accounted for by seasonal and part-time workers, replace-

ments for deaths, retirements, resignations, and dismissals, which run about 5 percent a year.

Acting Chairman WILLIAMS. You have an exclusion at the heading of that exhibit. Does that mean that those who are engaged in terminal facilities such as switching, and so forth, are not included?

Mr. HARRISON. No; they are not included because the figures for those companies for the earlier years are not comparable. In some years the Commission included switching and terminal companies in their condensed reports, and in other years included only class I railroads, excluding the switching and terminal companies. Thus in order to have a comparable basis clear back to 1920 it was necessary to exclude the switching and terminal companies.

Now, the switching—I can give you the figures, if you wish it—

Senator KING (interposing). That is, the number of employees in the switching and terminal companies. That number should be added, of course?

Mr. HARRISON. In 1938, Senator, for class I switching and terminal companies—that is, companies having operating revenue of a million dollars, or more—37,457 persons received compensation during the year, of which number 25,025 worked 12 months, or at some time during each of the 12 months, so you might add 25,000 more to the full opportunity figure, and that would include switching and terminal companies of class I railroads.

Acting Chairman WILLIAMS. As a matter of keeping the record straight, do you have it for 1939?

Mr. HARRISON. No; the figures for '39 for switching and terminal companies I do not have available right now, but I can get the figures for you.

Senator KING. They are substantially the same as you gave, I suppose?

Mr. HARRISON. I think it would be within 4 or 5 percent at the outside; for this purpose, I imagine you could take the same figure.

Dr. ANDERSON. Now, Mr. Harrison, reverting for a moment to the full-opportunity definition just given, would you regard that definition of the number of employees engaged in the railroad industry for any one of these years as a suitable base to use in calculating average wages or return for employees?

Mr. HARRISON. No; that would be in our judgment a very misleading basis, a very improper basis. Mr. Parmelee and I have quarreled about that for a long time. I notice in one of Mr. Parmelee's exhibits¹ he uses the same employment figures as I have, which are, as I say, the full-opportunity jobs, and they total about 400,000 less than the number of persons actually employed in the industry at one time or another throughout the year.

Now, he divides the full-opportunity jobs into the total amount of money paid the 1,300,000 persons, every dollar paid in compensation, so you have a distorted average annual wage of \$1,886, as he shows, for the year 1939.

Now, if you will take the total money paid in wages, which he shows as being \$1,863,503,000, and divide it by the 1,325,000 persons who actually got part of it at one time or another throughout the year, you will get a much different figure than \$1,886.

¹ See "Exhibit No. 2517," appendix, p. 17361.

I can give you some very illuminating information on that from the official report of the Railroad Retirement Board for 1939, and I refer to page 152.

In 1938 there were 1,325,973 persons who received compensation from class I railroads.

Dr. ANDERSON. Different persons?

Mr. HARRISON. Different individuals. There were 132,770 who received \$50 or less throughout the year. In the wage group of \$1,500 or more, there were approximately 600,000 persons.

Dr. ANDERSON. What was its range?

Mr. HARRISON. From \$1,500 to \$3,000 would be the range—600,000 persons.

Dr. ANDERSON. What would be the average compensation?

Mr. HARRISON. Somewhere between \$1,300 and \$1,400.

Senator KING. You mean, of that 600,000?

Mr. HARRISON. No; of the 1,300,000. Between \$1,300 and \$1,400.

Dr. ANDERSON. Well, if I understood Dr. Parmelee correctly yesterday, he said that as he recalled, from the same source, the average pay for 12-month men in 1937 was about \$1,650.

Mr. HARRISON. Yes; that is true.

Now, I have the figure for 1938 from the same source—Railroad Retirement Board. There were 803,884 persons who worked some time during each of the 12 months of that year. They represented 60.6 percent of the total persons receiving compensation during the year. The average earnings of this group was \$1,824.

Dr. ANDERSON. Would that average indicate the average earnings of railroad workers generally?

Mr. HARRISON. No; far from it.

Dr. ANDERSON. That is, could we assume that \$1,800 was available to the average railroad worker as the annual earnings?

Mr. HARRISON. Far from it; far from it.

Senator KING. Would not the average earnings of those employees who worked full time reach those figures or perhaps exceed them?

Mr. HARRISON. No, Senator King.

Mr. PIKE. How would this calculation go, Mr. Harrison? I figure that the average earnings for full-time employees (I will explain the basis, if you wish) would run about \$1,550.

Mr. HARRISON. I don't know; I don't think it will run that high.

Mr. PIKE. These figures show 2,520 hours a year, full time. At 40 hours, that is 2,060 hours a year, which is 62.5 percent of the average year shown. Now, take that percentage of the average earning shown gives you about \$1,550.

Mr. HARRISON. That may represent a rough approach to it. I don't think it is that high. We have a tremendously large number of men in the low-wage bracket; as you perhaps recall there were approximately 85,000 getting less than 40 cents an hour, regular workers.

Mr. PIKE. A good many of those are part-time, on maintenance, seasonally, are they not?

Mr. HARRISON. No; I have distributed it here by months. If you wish, I will give it to the committee. Of the total of 1,325,973 persons, 74 percent worked more than 6 months during the year 1938. Perhaps right here I might say this: the average hourly wage, ob-

tained by taking the total number of hours and dividing it into total compensation, is 73.1 cents per hour.

If you will refer to "Exhibit No. 2540,"¹ you will notice that between 1920 and '29, employment declined 12 points, approximately 400,000 jobs.

Since that time there has been a loss of about 700,000 jobs. Taking the year 1933, which represented the depth of the depression, there were about 971,000 jobs. In 1938 employment fell to 929,000 jobs, the lowest level in the history of the industry, or a period of 50 years.

Of course, that was caused by two elements: the general decline in the level of traffic and the technological advances.

Senator KING. When you speak of technological advance, you refer, I suppose, to the competition by water and other means of transportation?

Mr. HARRISON. No, I was referring particularly in that connection to the substitution of machinery, and consolidation within our own industry. Of course we have lost a tremendous percentage of our traffic to other modes of transportation, and that is a technological development in the field of transportation. I think it accounts for about 180,000 of our jobs.

CLASSIFICATION OF EMPLOYEES

Mr. HARRISON. The next exhibit shows a distribution of employment by major divisions as classified by the Commission, showing the decline over a period of years; the 1921 figure, 1,695,000, is taken as the base of this table. In 1939 there were 987,000 jobs.

(The table referred to was marked "Exhibit No. 2541" and is included in the appendix on p. 17373-17374.)

Dr. ANDERSON. I would like to ask a question with respect to "Exhibit No. 2541." Is this distribution into six classes, or five classes with two subgroups, the way in which occupational data are available in the railroad industry?

Mr. HARRISON. That is the way the Commission has instructed the railroads to divide the information on compensation and wages.

Dr. ANDERSON. Now, does this represent a vertical division of skill or compensation?

Mr. HARRISON. No, this shows the employment opportunities at the middle of the month for each of the major groups, and the purpose of the exhibit is to show how the various groups of employees took the impact of the recession in business, and the technological advance.

Dr. ANDERSON. But would there be a rough correspondence between the divisions I to VI, and levels of labor in the industry as indicated by earnings?

Mr. HARRISON. No; there has been a very much smaller displacement of executives, officials, and staff assistants on a percentage basis. That is the most regularized group so far as employment and wages are concerned. They took the least impact.

¹ Appendix, p. 17372.

There is always a place to put the executive to work. When you have to retrench, he generally gets one of the jobs of the classified service, and the classified service takes the impact.

Now, there was a dual effect in maintenance of way and structures. Your ability to keep house, as one would put it, is based on the railroad earnings. In times of financial stringency the maintenance-of-way workers have to take the impact of retrenchment, and the same with maintenance of equipment and stores. When the railroad has to meet bond interest and the amount in the till is rather low, they will shut the shops and lay off the shop men, so they take the impact of the financial difficulty.

On the other hand, if you have business and have to move trains, the engineers, firemen, conductors, and switchmen have to work, because they are moving the traffic. When the traffic is not there, of course they do not work. There is elasticity in the maintenance of equipment and way forces which permits a more violent squeezing, as one would put it, of employment.

Senator KING. The element of safety runs through these lists, does it not, so that it is vital that you shall maintain a high degree of safety?

Mr. HARRISON. Always, Senator King. The railroads try to maintain an absolutely safe operation, even though they have to borrow the money to do it when they cannot afford it.

Senator KING. And the record for safety, it seems to me, from the figures brought to my attention, are most excellent. The accidents to passengers in the operation of railroads have been very few.

Mr. HARRISON. We think we are operating the finest kind of transportation and the safest in the world. That is what we think about it.

Dr. ANDERSON. One more question with respect to that table, Mr. Harrison. Do you have any figures on wages and salaries paid to the various groups here represented? Take, for example, the first group of officials, executives, and staff assistants. There were 15,000 of them in '21, and 11,745 in 1939. Is it possible to know the total salaries paid that group that year as compared with the total wages paid the maintenance men, for example?

Mr. HARRISON. Well, may I file that? I have the information.

Dr. ANDERSON. If it is possible, Mr. Harrison, to file for available years the information on earnings corresponding to these levels, we could then compare the ability of these various groups to bear the impact in various years, as determined by available income.

Mr. HARRISON. All right, sir; I will be glad to give it to you. You want it on the basis shown in "Exhibit No. 2541"?

Dr. ANDERSON. Yes. We will reserve the next exhibit number for that information.

(The document referred to was subsequently submitted, marked "Exhibit No. 2542," and is included in the appendix on pp. 17374-17375.)

Mr. HARRISON. The next exhibit discloses the average hourly earnings over a period from 1920 to 1938, indicating the average rate was 71.1 cents per hour.

(The chart referred to was marked "Exhibit No. 2543," and is included in the appendix on p. 17376.)

DISTRIBUTION OF RAILROAD REVENUE

Mr. HARRISON. The next exhibit shows the operating revenues; that is, the amount of money that the railroads took in for furnishing transportation to the public. The revenue declined from \$6,178,000,000 in 1920 to \$3,995,000,000 in 1939, or 35.3 percent, while the compensation of the workers declined 49.4 percent, indicating a more rapid elimination of labor than the decline in business, based on dollars of revenue, would have required.

(The table referred to was marked "Exhibit No. 2544" and is included in the appendix on p. 17376.)

Mr. HARRISON. That is the result of technological improvements in the industry and the utilization of less labor to earn the dollar of revenue.

The next exhibit shows the distribution of the revenue taken in by the class I railroads from 1920 to 1939. I should call to your attention the fact that in 1920 labor received 55.4 cents out of each dollar taken in, while in 1939 it received only 44.4 cents. Fuel cost 10.9 cents of every dollar in 1920, and that had declined to 6.3 cents in 1938. Net railway operating income, which is the amount left after the expenses of running the railroad are paid, and before interest and dividends are taken out, represented 0.3 percent in 1920, and in 1939 it represented 14.7 percent, indicating the shift in the share of production, to which I called your attention earlier, from labor to capital.

(The table referred to was marked "Exhibit No. 2545" and is included in the appendix on p. 17377.)

Dr. ANDERSON. In most of the testimony thus far you have used a base of 1920. Now, in "Exhibit No. 2545," the sharpest increase you have is from 0.3 percent in 1920 to 11 percent in 1921. Is 1920 a reasonable basis for indices?

Mr. HARRISON. Well, I think it has some complications that you might very well question. We use it because that is the first year of private operation. The railroads were returned to their private owners on March 1, 1920. There was a period of 6 months that followed under Government guarantee. For the purposes of net railroad operating income, perhaps it is not a fair basis.

I would take 1921 for that basis, which might be questioned considered too conservative, because there was a wage cut in effect during that year. They got 10.9 cents out of every dollar in 1921, as compared to 14.7 cents out of every dollar in 1939 in net railway operating income.

That picture is there. It is questionable as to using—

Dr. ANDERSON (interposing). Should we consider the whole table with that same thought in mind, that the change-over from Government guarantees in 1920-21, when the railroads took possession of their properties again, set factors to work which made 1920 and 1921 unsuitable for comparison purposes?

Mr. HARRISON. No; I would not want to make that general admission. There are some elements that in 1920 would be unfair, and other elements where it would be fair. I would not want to make that general admission, not because of what is happening here, but because of the fellow I might have to meet a year from now on that issue. [Laughter.]

"Exhibit No. 2546" shows operating revenue per employee in our service, and hours of compensation, indicating the efficiency of the wage dollar.

(The table referred to is marked "Exhibit No. 2546" and is included in the appendix on p. 17378.)

Mr. HARRISON. Let us take 1921, now, in "Exhibit No. 2546." It shows the efficiency of the wage dollar, and we can take 1921 to avoid the 1920 condition. For every dollar paid the workers in 1921 they produced gross revenue for the railroad company of \$1.99. That is shown in the second last column opposite the year 1921. In 1939 for every dollar paid in wages to the workers they produced revenue for the corporation of \$2.14, an increase of 15 cents; in other words, it became more profitable to employ labor over that period of time, to the extent of 15 cents for every dollar expended for wages. Expressed differently, the output per worker increased tremendously and the number of workers declined. The result of their labor became more profitable to the owners of the industry by 15 percent over the period.

Exhibit No. 2547 discloses freight revenues per revenue ton-mile. That indicates the amount that we collected on the average from the public.

Dr. LUBIN. May I interrupt at that point? Would you state the figures on operating revenue per employee per hour of service for 1920 and 1939. Average hourly earnings were very close in these 2 years, so that in terms of what the worker was getting for the service rendered, I think the comparison between 1920 and 1939 would be fairer than between 1921 and '39, since wages were cut in 1921.

Mr. HARRISON. I think you are right about it.

"Exhibit No. 2546" discloses that in 1920, for every dollar expended for wages the worker produced \$1.68 in revenue for the corporation, or a profit of 68 cents on every dollar he received. In 1939, for every dollar paid the worker, he produced \$2.14 for his employer, a profit of \$1.14.

Senator KING. Is that in the net earnings of the railroad?

Mr. HARRISON. No; the amount taken in, Senator.

Senator KING. But the net earnings of the railroad did not show that disparity?

Mr. HARRISON. The net profit?

Senator KING. Yes.

Mr. HARRISON. No; generally speaking the net profit of the railroads has been in bad shape. However, it has become increasingly profitable to employ the worker; he gets a constantly lesser share of the joint effort of management and capital and the worker as I showed in "Exhibit No. 2545." In 1920 labor got 55.4 cents out of every dollar, while in 1939 it received only 44.4 cents. Capital got 0.3 percent of every dollar in the year 1920, while in '39 it got 14.7 cents, but I agree with you, Senator, in dollars, as a whole, the industry of course has been suffering very badly.

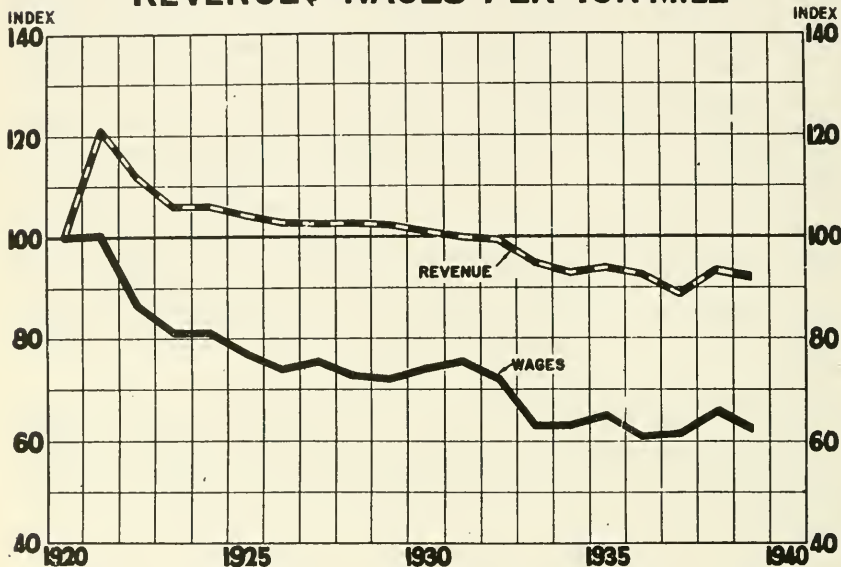
"Exhibit No. 2547" shows freight revenues per ton-mile, representing the amount we collected from the public for the transportation of freight. You will note a decline from 1.052 cents in 1920 to .974 cents in 1939 for moving 1 ton of freight 1 mile, indicating the general improvement in the efficiency of the plant and the ability of the plant to pass on to the public part of the savings.

(The chart referred to was marked "Exhibit No. 2547" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17378.)

EXHIBIT No. 2547

[Submitted by the Brotherhood of Railway Clerks]

REVENUE AND WAGES PER TON-MILE



Mr. HARRISON. The wages to move a ton of freight 1 mile in 1920 were 0.897 cent, while in 1939 that had declined to 0.559 cent, indicating labor's proportion of what was taken in. Out of 0.974 cent for every ton of freight moved 1 mile, labor got 0.559, or a little bit more than half. That is graphically displayed in the accompanying chart.

Senator KING. Of course the improvement of the trackage and so on would diminish the cost of moving the freight.

Mr. HARRISON. There is a joint element there, Senator—personnel, increased efficiency of the average man, better plant, better supervision, consolidations, and elimination of waste, and a number of other elements. Capital had its part, management had its part, and labor had its part.

Dr. ANDERSON. Mr. Harrison, is there any trend noticeable in this connection that might indicate either acceleration or the reverse?

Mr. HARRISON. No; I think that that is the general avenue we are traveling.

I think the unit price to the public is going down constantly, and the share that labor gets out of the industry is constantly declining. I

don't see any hope for a reversal of that so long as present conditions prevail. But on the other hand, I see a very serious condition for our country, for our people, if we don't find some way to check it, and I take it that is the purpose of this hearing. I want to say something about it before I quit, if the committee will permit.

INCREASE OF LABOR PRODUCTIVITY

Mr. HARRISON. Exhibits Nos. 2548 to 2565 represent a series of exhibits disclosing the productivity of the workers measured by the miles of track operated and the compensation paid. I offer the first 12 of the series for the record.

(The tables and charts referred to were marked "Exhibits Nos. 2548 to 2559" and are included in the appendix on pp. 17379-17387.)

Mr. HARRISON. Briefly, in 1920 an average of 5.4 workers was required for every mile of track operated, while in 1938 only an average of 2.4 workers was required. In 1920, wages per mile of track operated were \$9,756; in 1938 they were only about one-half, or \$4,437. The changes are graphically disclosed on Exhibit No. 2549.

Exhibit No. 2550 shows the change in the revenue freight ton-miles by thousands. I would simply point out that in 1920 there were 410,306,210,000 revenue freight ton-miles as against 333,000,000,000-odd in 1939, a decline of 19 points, while the number of revenue ton-miles handled by each employee went up from 202,000 to 337,000, or an increase of 66 percent. For every dollar of compensation paid in 1920, 111.4 revenue tons were handled 1 mile.

In 1939 that had increased to 138.9 tons for every dollar paid in wages, or an increase of 60 percent in efficiency.

"Exhibits Nos. 2551 to 2558" show pretty much the same general story, and I will not consume the time of the committee to comment unless some member of the committee may wish it.

"Exhibit No. 2560" now comes to the crux of my problem before this committee.

(The table referred to was marked "Exhibit No. 2560" and is included in the appendix on p. 17388.)

Mr. HARRISON. This exhibit discloses the loss in employment opportunities caused by the great increase in the productive efficiency of the plant and personnel. We have coined a measure called a traffic unit, which is described at the bottom of exhibit 2560. In the first column is average receipts per passenger-mile. In 1921 that was 3.086 cents. The average receipts for each freight ton-mile were 1.275 cents. The ratio of passenger revenue to freight revenue was 2:4. Adjusting the passenger miles and increasing the freight miles to get the proper equation, you will find that we have a new balance of traffic units for each of the years shown, in the far right-hand column. In 1921 it was 396,390,000. Bearing in mind the traffic unit as the base of determining the productive efficiency of the plant and the personnel, we go to the next exhibit and we disclose the number of employment opportunities destroyed by this tremendous increase in efficiency.

(The table referred to was marked "Exhibit No. 2561" and is included in the appendix on p. 17388.)

Mr. HARRISON. In 1922 we had lost 218,000 employment opportunities because of increased efficiency. In other words, if we had

remained stationary and handled the same amount of traffic units in 1922 that we handled in 1921 we would have had 218,846 more jobs than we did have, so following that down to the year 1939 as compared with the year 1921, we are short because of technological advance in our industry—and I say that in a broad sense—626,426 jobs. Expressed differently, if the efficiency of the plant and the personnel had remained constant over that period of 19 years we would have 63 percent more employment opportunities today in the railroad industry than we do have. That tells you the story as to what has happened to employment—622,426 jobs have been destroyed in this industry over that period of time.

Mr. PIKE. I don't quite get all of it, Mr. Harrison. This includes as near as I get it both increase in efficiency and decrease in traffic.

Mr. HARRISON. No. This only covers the increase in efficiency. I have taken the actual traffic for each year and I have translated that into traffic units, which is the productive unit, and if the efficiency had remained constant we would have 622,426 more jobs today.

Mr. PIKE. Oh, that second column says the 1921 rate of efficiency rather than the 1921 rate of traffic.

Mr. HARRISON. That is right.

Senator KING. When you speak of efficiency as you have used it, do you refer solely and exclusively to the efficiency of the individual, or the efficiency as it may be translated to and incorporated in better machinery, better trackage, improved facilities? Would you call that part of the efficiency which has produced the figures which you have just given?

Mr. HARRISON. That is true, Senator. We have a more efficient human individual, a more efficient tool, and more efficient supervision. All of the elements combined have produced the destruction of 622,000 jobs.

Senator KING. A person who is technically more efficient manifests better results in the work he does, the track is better, the engine is better, so that the efficiency of the individual is manifested in the increased efficiency of the tools.

Mr. HARRISON. That is right. You see, the individual is working under supervision with the machinery and the tools that management furnishes, and all of those elements, Senator, enter into it.

Senator KING. They are all integrated.

Mr. HARRISON. I want to make it clear that railroad labor is willing to recognize that capital has made it possible to use the new type of tool and has furnished the opportunity for employment directly to that extent. Management has improved supervision, and labor individually has increased its ability, and has utilized these new implements for greater production.

Senator KING. As far as my observation is concerned, I think there has been greater cooperation by and large in the railroad operations from the head down to the humblest man working than in many of the industries.

Mr. HARRISON. Thank you. We feel that we have made a heroic effort, all of us, all elements.

Senator KING. I think the railroad employee deserves the gratitude of the American people for cooperation in making the railroad system serviceable to the public.

(Senator King resumed the chair.)

UNEMPLOYMENT IN VARIOUS LABOR GROUPS

Mr. HARRISON. The following tables, "Exhibits Nos. 2562 to 2568," distribute the impact of that unemployment to the various major occupational groups.

(The tables referred to were marked "Exhibits Nos. 2562 to 2568" and are included in the appendix on p. 17389-17395.)

Mr. HARRISON. "Exhibit No. 2568" has to do with an analysis of that same element of job destruction through increased efficiency in the train and engine service, the men that actually move the trains. You will note over there in the next to last column on the right we are short 73,502 jobs, engineers, firemen, switchmen, brakemen, conductors, all because of the ability of the force to move a greater amount of freight than they did in the year 1921.

The traffic units per locomotive mile in 1921 were 269, which increased to 297 in 1939. The average number of locomotive miles for each employee engaged went up from 4,941 in 1921 to 5,322 in 1939. It would have required an increase of 35 percent in existing personnel to bring us back to the same employment level for engineers, firemen, conductors, trainmen, and switchmen, that existed in 1921.

That concludes my statistical information and I want to make a few observations on the general problem, if I may be permitted.

Acting Chairman KING. Proceed. The committee will be glad to hear you.

Mr. HARRISON. Our industry has, of course, been beset by all the elements of the depression, together with the development of other modes of transportation and discriminatory Federal policy in that direction. Our competitors have been aided directly and indirectly by the Government, and it has been a terrific struggle for men and management. We are trying to correct that. The Government not only has handicapped us and given our opponent an advantage, but has gone into business directly in opposition to us through the parcel post, the waterways and barge lines, and of course private enterprise cannot meet that situation very successfully. The railroad workers have paid the penalty through the loss of their opportunity to live. That, together with the effect of the depression and the financial difficulties of corporations, has made it a very sorry, hopeless picture for railroad labor. As you can see by the statistical information I have put in, we have only about half the full employment opportunities today that we had 20 years ago. I hope that trend can be reversed, but to the extent that unemployment exists it is our general national problem, and the people of this country, if I might interpret their views, are looking to the Members of Congress and to the administration to do something about it. We have not had since 1933, so far as employment is concerned, much improvement. We are spending huge Federal sums, the public debt is \$45,000,000,000, and thinking persons are beginning to worry about that. Just where are we going? If we reflect on what has taken place in other countries throughout the world, we see that the desire for liberty and freedom is not sufficiently strong to resist the human urge to stay alive. In many instances the people have traded that valuable asset and heritage because of the need to keep alive. We can talk all we want to, my good friends, about our democratic political and social institutions, but we have got to solve this problem of unemployment. If we don't,

it is going to wreck us, and with us, democracy. I am not an alarmist and I don't wave a red flag very frequently; I try to be realistic about it. I think there has been a constant shifting of too large a percentage of the results of industry to the people who own industry; not enough has been put into the pockets of the people of the country to sustain our great industrial machine. That has to be halted. Capital can't dry up the sources that create it. Labor was prior to capital, which represents nothing but the surplus of someone's labor of the day before. As Abraham Lincoln said years ago, it has nothing in it of living substance, it is only handy to do some things that we have to do. Unless we can profitably employ labor, the whole structure is going to fall.

Our remedy for the situation is a constant shifting, to a reasonable point, of the proceeds of industry to those who sustain it, with a progressive shortening of the hours—always admitting, of course, that we must pass on to the public a share of the improved efficiency. We in the railroad industry think the time has long since passed when we ought to work as much as 56 hours a week in a good many instances and 48 hours generally for regular employment opportunities. Nationally, under the wages-and-hours law, we have reduced the hours to 42 and ultimately to 40. Our industry is still working 48. We have been trying to get through Congress a 6-hour law, but so far the Senators and Congressmen have indicated that they don't think the time has arrived to enact that kind of legislation. I have been before the committees of Congress repeatedly, urging some solution of this problem. When we realize that we are confronted with consolidations that will undoubtedly diminish employment, it is a pretty hopeless looking picture for the man who has spent his lifetime in the railroad industry. For a large share of these people it means the destruction of their entire investment, because they are in specialized service; they cannot find employment elsewhere, even if there were jobs available. The locomotive engineer can't run a locomotive any place except on a railroad. There are a few around some sawmills and a few of the mines, but if you put them all together they wouldn't mean very much.

I hope that this Congress will make a genuine attack on this problem and reduce the hours in the railroad industry and give these people who have been squeezed out of the industry by these several elements an opportunity to come back in. A genuine attack, I hope, will be made on the whole thing in the way of shortening hours. By the utilization of these new methods and machines, we have outstripped our ability to provide work.

I imagine if there weren't enough bread to go around in this country, we would pass a law taking control of the bread, and distribute it so everybody would have bread. Well, when you talk about people having bread and no jobs, you are talking about giving and taking away, because under our system in order to have bread you must have a job. There isn't any other way to get bread except to go out and steal it, borrow it, or inherit it, but most of us poor devils, who have to work for a living, have only that means of sustaining ourselves and our families, and if you don't furnish us that opportunity we get very little substance out of our whole social philosophy and our structure of government. I am trying to view

the problem realistically. I don't want to be an alarmist, because I think I am more or less one of these individuals who tries to keep his feet on the ground if he knows the facts, and be very conservative about it, but there is a real problem in this country and we have got to find a solution for it. What it is I don't know in total, but some things could be done in the direction I have indicated.

Acting Chairman KING. Do you think the Federal Government should subsidize the railroads, as it is subsidizing waterways and subsidizing truckage, by spending hundreds of millions of dollars annually for roads to facilitate transportation of commodities by trucks?

Mr. HARRISON. No, I don't think we ought to pick the pockets of the public in that fashion. I think the railroads and every other form of transportation ought to operate as private enterprises without subsidy. If the railroads can't do that, let the Government take them over and go in the business of transportation and pay the losses as part of the general social function. No subsidy. That is a process that I am violently opposed to, whether it be for the shipowner, truck operator by utilizing the highway, or the inland water carrier by using the inland waterway. That is just a polite way of picking the pocket of Mr. John Average Citizen, as I view the matter.

Acting Chairman KING. Would there be any impropriety in the Federal Government's attempting to secure revenue from the operation of the trucks—building the highways and waterways and having those who avail themselves of those instrumentalities at the cost of the Government make some contribution?

Mr. HARRISON. I think there ought to be a fair tax levied for the private use of public property. If I went out here and used one of your post office buildings you would certainly expect to collect rent from me, but I can go into the trucking business and utilize your highway and give you nothing for it. You improve the inland stream and I can go into the business of operating barges; you spend the money to maintain the right of way for me. Now that is unfair. The railroads pay part of those taxes, I pay part of them as a railroad worker, and I certainly don't like it and I hope it will be corrected.

Acting Chairman KING. Have you finished your statement?

Mr. HARRISON. Yes, sir.

RATE OF TECHNOLOGICAL CHANGE

Mr. O'CONNELL. May I ask a question? The subject of the hearing is supposed to relate generally to the effect of technological advance, and I wondered whether you had any judgment as to whether the rate of technological change in the railroad industry had been accelerated in the past 20 years, say, as opposed to the first 20 years of the century.

Mr. HARRISON. I wouldn't say that the rate of changing methods has been accelerated, but the effect has been accelerated. They were also introducing new types of machines back in the old days, and new methods, to the extent that they were available. I suppose the rate of change has been somewhat along the same line, but the effect of the change has been more substantial.

Mr. PIKE. It is greater when business is declining.

Mr. HARRISON. The pressure under low profits accentuates technological advance.

Mr. O'CONNELL. As far as the railroad industry is concerned, might not the emergence of competitive facilities, such as the trucks, have had its effect in accelerating the effects of technological change?

Mr. HARRISON. I wish I could say that; I don't think we have met that problem yet.

Mr. O'CONNELL. Haven't met it yet, but to the extent that technological changes have been made it has been in an effort to meet the problem.

Mr. HARRISON. Well, I wouldn't say that either. There have been some changes, but in this whole picture they are nil.

Mr. O'CONNELL. I didn't understand you.

Mr. HARRISON. I say there have been some changes to meet truck competition, but in this whole picture their effect has been nil.

Mr. O'CONNELL. You mean they have not been able to meet the truck?

Mr. HARRISON. No; they just haven't met that problem yet, and we don't think they can meet it with the present plan. You have got to have more flexible, lighter, more frequent service.

Mr. O'CONNELL. But you are arguing for more rapid technological change in the railroad industry.

Mr. HARRISON. That is right, but with it will come increased employment because you will have more units and you will need more men.

Mr. O'CONNELL. So the railroad industry in your view has not been sufficiently alert in making technological changes to meet the conditions.

Mr. HARRISON. That is true. They still hang on to the old equipment. There are two or three reasons for that. First is the different thought among management officers about it, and secondly their financial inability to make the change. Tremendous sums have been invested in this heavy power, heavy equipment, and they can't charge it off because most of it is plastered with a mortgage, unless they substitute or pay the mortgage. Well, they don't have the wherewithal to substitute or pay the mortgage.

Mr. O'CONNELL. Their financial inability to make a change at this time might in itself be a result of failure to keep pace with technological changes over the previous decades.

Mr. HARRISON. I think there is a lot to that, but on the other hand, as I said earlier, a lot of management officers believe they are on the right track with the heavy power. We think they are on the wrong track, that they are just going to wind up on the siding, and the other fellow is going to get our business.

Acting Chairman KING. There isn't much encouragement to invest in railroad stocks and bonds, to make capital investments, in view of the mortality that we witness in the railroads?

Mr. HARRISON. Well, Senator, I am a member of my organization's finance committee, which has large sums of money to invest, and we don't invest one dime in the railroads.

Dr. LUBIN. Mr. Harrison, I would like to ask you a question which has some bearing upon your testimony, and also I think upon the

broader field of economic progress. I was very much interested in a statement you made relative to the new devices and new methods that have been adopted by the railroads that make it unnecessary for them not only to use as much labor but, as I take it, as much capital. If by creosoting a wooden tie you increase the average life from 7 years to 21 years—triple it, in other words—and your investment in that tie of course is nowhere near as much as the original investment, you have automatically created a situation where the railroads need less money to maintain a given level of output, as time goes on. Now is it your impression that the same holds true of other types of equipment? For example, a modern locomotive costing X dollars would give you in terms of its total life many times more ton-miles of service than a locomotive that cost X dollars 25 years ago. Would that be true?

Mr. HARRISON. That is true, yes.

Dr. LUBIN. So that we can expect, once the railroads reach the point of known possible efficiency, that their need to invest more and more money will gradually decline.

Mr. HARRISON. I think that is true if they continue with the present equipment and don't undertake to junk it and replace it, but the investment of either more or less money, Mr. Lubin, doesn't seem to affect our railroad financial operating result, because we have outstanding a huge amount of bonds, and even though we do reduce the amount of actual operating expense we don't retire the debt. If you look over the history of the railroad situation you will see they generally pay a maturing bond issue by issuing a new one, they generally get a little extra money for the till, corporate purposes, as they call it; if you will look at that exhibit I introduced, the bonds outstanding have gone up right along. The problem you are talking about is the matter of operating expenses, so far as the ties are concerned. Ordinary maintenance of the track would be operating expenses, but of course a locomotive would go into capital account as additions and betterments. If I get the theory that you are pursuing with your question, I would say that the technological advances make it unnecessary, of course, to employ as much capital over the long run as before. Now, of course, they are making the investment, and the capital required is much larger than it would be under the old system. A man buys a suit of clothes for \$50 which will last him 3 years, and a man buying a suit of clothes for \$20 has to have two every year. He has to have more capital outlay for the \$50 suit, but in the long run it takes less.

EFFECT OF INCREASED TRAFFIC ON EMPLOYMENT

Dr. ANDERSON. I have just one or two final questions, Mr. Harrison. In your approach here you discuss and arrive at a measure of decreasing job opportunities. As a concluding statement I wonder if you would help us by putting individuals back into this picture and telling us what has occurred to the normal labor force that called themselves railroad men. For example, Mr. Pelley yesterday, in answer to a question of mine, said there was an excess of available labor over labor being employed of about 100,000, and also went on to say that should the traffic of your railroads increase somewhat beyond the 1937 level, new workers would be needed in the railroad industry, that as a matter

of fact in '37 some new workers were added to railroad labor who had never been employed before. His point was that the problem solves itself with an increase in railroad traffic somewhat beyond 1937 levels. You indicated that in '39 1,325,000 different persons were listed as railroad workers. Would you care to hazard a guess as to the size of the railroad labor force not employed, and whether the prospect that Mr. Pelley laid out before us is realistic from your point of view?

Mr. HARRISON. Mathematically he is probably right, but in actual practice, no. That varies by territories. You see, there is a normal attrition in the personnel of a railroad of about 5 percent a year, and since 1920, a period of 20 years, there should have been a 100-percent turn-over in force, but that has not been true. Considering the attrition and the increase in traffic, I think if we go back to the 1937 level we will mathematically absorb the people ordinarily attached to the industry who are called railroad workers, but that won't absorb them throughout the country. Conditions vary on the railroad properties. At some places we are hiring new men of a particular class right now, and we still have men out of work on that particular railroad of a different class of service. Down in Florida we hire men to handle the winter traffic while we are laying them off in the Middle West because traffic has fallen off; on the west coast when we move the food crop we will be hiring men, and laying them off in Florida. In the winter-time we are moving coal, and so on. We have tried to regularize that, by pointing out to the railroads that they ought to recruit workers from different sections who are already attached to the industry instead of taking on new men, and, to that extent minimize the effect of these fluctuations. But getting back to your question, I think perhaps Mr. Pelley is right. If we could get back to the '37 level of business we could give a job to every unemployed person who has been attached to our industry. That is made possible by increase in business to the '37 level and by the actual attrition that has occurred among the workers over a period of time.

Dr. ANDERSON. Do you care to make a prophecy as to whether or not it is possible to get back to '37 levels in railroading and to stay at such levels?

Mr. HARRISON. I would just be shooting in the dark. I have guessed so many times, along with a lot of these other economists, about what is going to happen to business that I am almost afraid to make a guess. But I think the railroads will get back to the '37 level of business, if the Government will adopt a fair policy in regard to transportation and give us a fair chance to compete for the available business.

Dr. ANDERSON. Would a return to 1937 levels solve your problem with respect to unemployment in the future?

Mr. HARRISON. No; because I am interested in employment opportunities rather than individuals that are attached to the industry. If our industry doesn't produce its share of employment opportunities, it doesn't make its contribution to the whole scheme of things. We can take back in our industry all the individuals that have at one time or another been associated with us, but when we make an allowance for the attrition and say that that squares up everything and we are satisfied, I say, no. We want a volume of employment comparable to the volume of employment we had in 1929, at least 1,600,000

jobs. If the country is going to get back to the level it was then, with everybody employed except about 2,000,000 temporary employees who were shifting and didn't want to work, we have got to get our share back.

Acting Chairman KING. You believe the railroads ought to be dynamic, that you ought to have a dynamic industry instead of a static one.

Mr. HARRISON. That is right, a growing, up-and-at-'em industry providing opportunities for men, management, and money.¹

Acting Chairman KING. We are very much obliged to you, Mr. Harrison.

(The witness, Mr. Harrison, was excused.)

Acting Chairman KING. The committee will recess until 10:30 tomorrow morning.

(Whereupon, at 12:55 p. m. the committee recessed until 10:30 a. m. Wednesday, April 17, 1940.)

¹ See *infra*, pp. 16899-16919, for further testimony on the railroad industry.

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

WEDNESDAY, APRIL 17, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:50 a. m., pursuant to adjournment on Tuesday, April 16, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representative Williams; Messrs. O'Connell, Pike, Lubin, Kreps, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; Corrington Gill, Works Progress Administration; Boris Stern, Department of Labor; and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Today's hearings and tomorrow's will be devoted to the communications industry and technology in that industry. As has been customary we have both management and labor represented in the hearings, and the first witness today, Mr. William H. Harrison, is the representative of management. He is the vice president of the American Telephone & Telegraph Co., of New York, New York City.

Mr. Harrison.

The CHAIRMAN. It is customary for us to swear the witnesses.

Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. HARRISON. I do.

TESTIMONY OF WILLIAM H. HARRISON, VICE PRESIDENT, AMERICAN TELEPHONE & TELEGRAPH CO., NEW YORK, N. Y.

Mr. HARRISON. Mr. Chairman and gentlemen of the committee, my statement deals with the American Telephone & Telegraph Co., and its principal telephone subsidiaries, which comprise upward of 90 percent of the entire Bell System organization. In the country as a whole, including the independent companies, there are now about 21,000,000 telephones, nearly 17,000,000 of which are operated by the Bell companies.

Some of the more significant aspects of the growth of the Bell System business are illustrated in "Exhibit No. 2569," which is the first exhibit attached to that brief statement, and I shall be glad to discuss the details of that in just a moment.

(The chart referred to was marked "Exhibit No. 2569" and appears below.

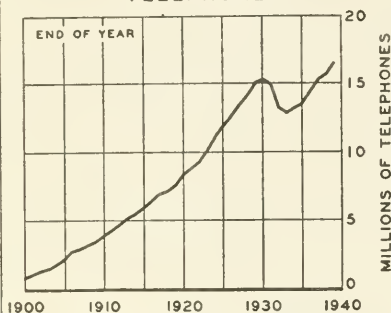
EXHIBIT No. 2569

[Submitted by the American Telephone and Telegraph Co.]

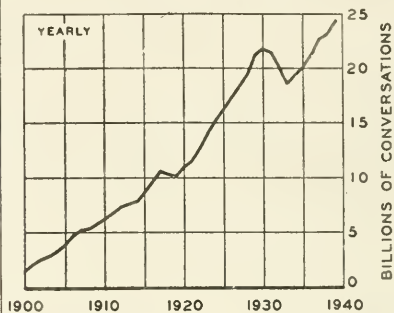
BELL SYSTEM

A. T. & T. CO. AND ITS PRINCIPAL TELEPHONE SUBSIDIARIES

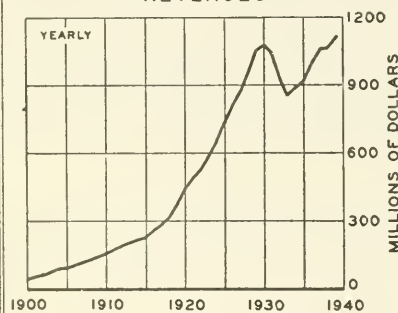
TELEPHONES



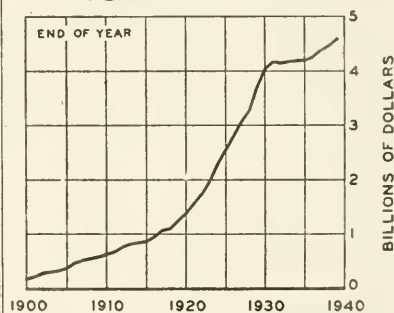
CONVERSATIONS



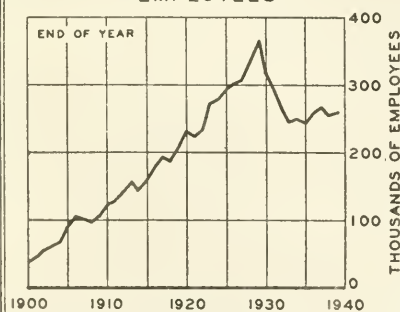
REVENUES



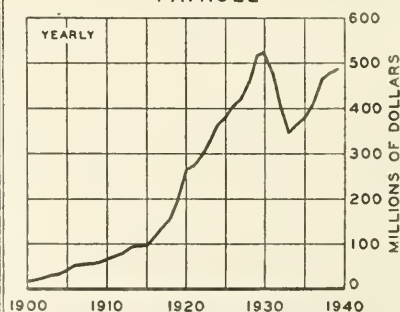
PLANT INVESTMENT



EMPLOYEES



PAYROLL



The CHAIRMAN. What about that other 10 percent?

Mr. HARRISON. They represent the Western Electric Co., the Bell Laboratories, Electrical Research Products—not engaged——

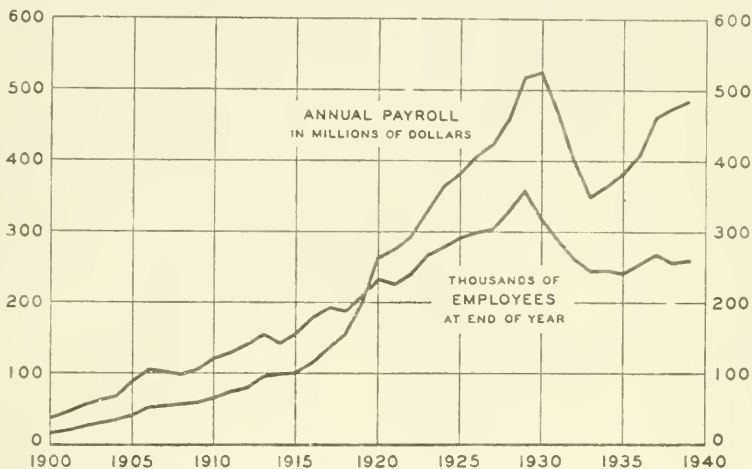
EXHIBIT No. 2570

[Submitted by the American Telephone and Telegraph Co.]

BELL SYSTEM

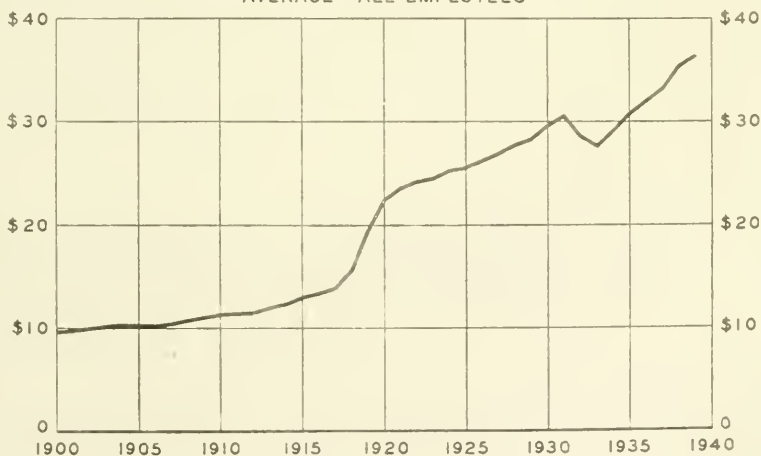
A.T. & T. CO. AND ITS PRINCIPAL TELEPHONE SUBSIDIARIES

EMPLOYEES AND PAYROLL



EMPLOYEES WEEKLY EARNINGS

AVERAGE - ALL EMPLOYEES



The CHAIRMAN (interposing). In communications?

Mr. HARRISON. In day-to-day telephone work. I am dealing here with the day-to-day operations as contrasted with the manufacturing and the research organizations.

The CHAIRMAN. There is some telephone system outside of the Bell System?

Mr. HARRISON. Yes; there are roughly 6,000 companies, as I remember the figure, and they serve about 4,000,000 telephones. I think they have an investment of somewhere around \$600,000,000 or \$700,000,000.

The CHAIRMAN. Thank you.

Mr. HARRISON. The telephone business is a business based upon scientific discovery and scientific invention.

Without the continuous chain of technological developments which have taken place in the telephone field since the original Bell invention, growth of this magnitude indicated on the charts would not have occurred—telephone service of the present-day scope and character would not have been possible. As I use the term technological development, I mean changes in the art broadly, and not merely those changes affecting the labor content of the individual operations.

Because of the very nature of the business, technology is present in all phases of telephone operations. It is fundamental to the quality and low cost of service. However, I do not plan to discuss its relation to these factors, but I want to come directly to the matter of employment.

The basic facts as to employment are given in "Exhibit No. 2570," which shows the growth in total wages, total employment, and earnings per employee per week from 1900 up to the present. Although not so indicated on the exhibit, it is significant that over the years indicated there, labor has received a practically constant proportion of the revenue dollar.

(The chart referred to was marked "Exhibit No. 2570" and appears on p. 16641.)

Mr. HARRISON. By overcoming, one after another, physical limitations upon the possibilities of telephone expansion, technology has increased the aggregate opportunities for employment. Similarly, it has created new investment opportunities and has expanded the demand for capital goods. By making possible more economical operations, technology has made for higher wages, shorter hours, more skilled jobs, and many other betterments in working conditions in the telephone industry.

The CHAIRMAN. Now, may I refer to your chart on employees and pay roll.¹ That would seem to indicate that the number of employees has steadily increased from 1900 to about 1929 when the peak was reached.

Mr. HARRISON. Yes, sir. .

The CHAIRMAN. That thereafter there was a substantial falling off in the number of employees apparently until about 1932, when it sort of leveled off, and in 1935 there was a slight increase and then another little falling off, and it is now leveling off again, but the number of employees has never come back to anything like the peak of 1929.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And in fact it is now below what it apparently was in 1924. Is that right?

Mr. HARRISON. Well, I don't think it gets back to the 1924 figure but—

¹ "Exhibit No. 2570," supra, p. 16641.

The CHAIRMAN (interposing). Well, I say that because your line crosses the 1925 line——

Mr. HARRISON (interposing). It is right in there somewhere. I plan to discuss, Senator, in a moment or two the reasons for that change.

The CHAIRMAN. You may discuss them; I was just pointing out the chart to see if I understood it.

Mr. HARRISON. That is correct, sir.

The CHAIRMAN. The annual pay roll likewise reached a peak in 1929, fell off precipitously thereafter until 1932, and that pay roll has been going up since, and the rate of increase in the pay roll is much greater than the increase in the number of employees.

Mr. HARRISON. Yes, sir; and the rate of pay to the individual employee has similarly increased each year.

The CHAIRMAN. In other words, the employees are now getting more in their envelopes.

Mr. HARRISON. But there are fewer of them.

The CHAIRMAN. But there are fewer of them.

Mr. HARRISON. Yes, sir.

I would like to say that since the beginning it has been our aim and policy to introduce improved practices and improved apparatus in such a way as to avoid or minimize adverse effects in the nature of economic waste or human hardship. Broadly speaking, employees affected by improvements in apparatus or operating methods have not been laid off, but have been retrained and reassigned. An exception to this is where manual offices are converted to dial operation; here it is impossible to reassign all of the operators displaced, and I plan to discuss this specifically in a moment or two, if I may.

Looking ahead, as we see the situation, there is a large potential market for more and more telephone service and we are exerting our energies to develop this market.

We are counting on continued advances in technology to help in this, and I am confident that employment opportunities, as well as the need for new capital goods for plant additions, will be increased. As a matter of fact, our current gains point specifically to that.

INTRODUCTION OF DIAL SWITCHBOARD

Mr. HARRISON. In the committee's advance statement specific reference is made to the failure of substantial recovery since 1933 to eliminate unemployment, and I want to discuss this from the over-all standpoint of our business. That is the point the Senator spoke of a moment ago. Before doing that, I would like to revert to the dial switchboard, since now and then reference is made to the effect of these switchboards on employment.

As the business expanded it early became evident that the future demand for service would be such that switching systems and operating methods would continue to be more and more complex and it was clear that manual operation, even with such automatic features as could reasonably be introduced, would be less and less suitable for handling the anticipated volumes of traffic, to say nothing of permitting improvements in quality of service.

As an indication of this problem, one has but to consider the situation in one of the large cities where hundreds of thousands of tele-

phones are served from many central offices. Each subscriber in this network—and it must be borne in mind that there are many types of service: business, residence, coin box, measured, flat rate, etc.—must be able to reach promptly every other subscriber and every other class of service. Furthermore, the necessity for reaching the extensive suburban areas as well as the vast number of cities, towns, and rural communities throughout the country requires the handling of enormous volumes of suburban and long-distance messages daily, each of which must be recorded, supervised, and timed.

There are some 90,000,000 calls per day, and one can readily appreciate the growing complexity of the operating work to meet this situation and the difficulty of maintaining an accurate and efficient service through the medium of manual operating methods alone. From such practical realities as these, it was certain that manual switchboards, even with such automatic features as could be provided to assist the operator, could not continue indefinitely to meet adequately the local operating problems of the larger cities.

It inevitably followed that machine switching equipment to complete certain types of connections entirely by mechanical means would ultimately be required. After exhaustive investigations and experiments, an automatic switchboard which met the exacting service conditions was developed and introduced for general use in the early 1920's.

Of course, in cities where the dial switchboard is used, many operators are required. Dial substitutes electromechanical processes for some, but not all, of the manual operations. Operators are needed for many services associated with the dial—among them the handling of charges, information services, and numerous other services of that character. Also a great many operators continue to be required for handling toll and long-distance calls. Then, too, with dial, additional men of greater skill are required for day-to-day operation and maintenance as compared with manual.

There have been lay-offs of operators as individual central offices have been converted from manual to dial. These have been scattered and have not been large in relation to the operating force as a whole. Also, for the most part those released had been engaged for the specific period preceding the conversions. Everything possible, including long-term planning and, generally, separation allowances, is done to minimize the consequences of the change-over.

Conjecture as to the number of operators that would be required today, whether they be more or whether they be less, had the dial switchboard not been introduced, is futile. As I have indicated, present-day scope, quality, and price of telephone service would be impossible under all-manual operation.

Coming now to the broader question, which is employment opportunities since 1933, referring again to "Exhibit No. 2569," I think it will be clear from that that recovery of revenues, of numbers of telephones and numbers of conversations, and of total wages have been about the same. As a matter of fact, recovery of the service to the customers, that is, telephones and conversations, and wages to employees have increased more rapidly than have the revenues of the business. I think that will be evident.

The CHAIRMAN. The pay roll apparently fell off to a greater extent than the revenues did.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And the gain has been about on a parallel, I would say from the graphs.

Mr. HARRISON. I haven't figured it out precisely. I am rather under the impression that pay rolls increased a little faster. We may be talking in terms of a few percent, but whatever it is it is on the high side rather than the low side.

The CHAIRMAN. The revenues or the pay roll?

Mr. HARRISON. No; the pay roll is on the high side in relation to the revenues; that is, if anything.

Mr. PIKE. It doesn't look it from this chart, Mr. Harrison. Pay roll has not recovered up to the 1930 figure. It looks as if revenues had gone slightly beyond that.

Mr. HARRISON. I am sorry I did not make the point clear. I was thinking in terms of rate of recovery rather than in terms of absolute comparison. I am sorry I did not make that clear.

The CHAIRMAN. Now, there are six charts on this exhibit.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. All of these, with the exception of the chart representing plant investment, shows a decline after 1929. That investment did not drop off, and later began to increase. All of them, including plant investment, and with the exception now only of the chart representing employees, have shown a striking gain after 1932 or 1933. In the charts representing the number of employees, do you find that there has not been the recovery which is evidenced in each of the other factors represented on these charts?

Mr. HARRISON. Yes, sir.

The CHAIRMAN. That is correct?

Mr. HARRISON. That is correct, sir, and I would like to go right to that point.

Dr. ANDERSON. Before doing so, I wonder if we could have the tabular material on which these charts are based?

Mr. HARRISON. I am sorry that I haven't it with me. I have tried to treat this in rather broad terms, but I will be very glad to have the data filed. I was afraid of getting myself messed up in too many detailed figures.

The CHAIRMAN. It can be done.

Mr. HARRISON. It has been done, too.

ANALYSIS OF LABOR FORCE

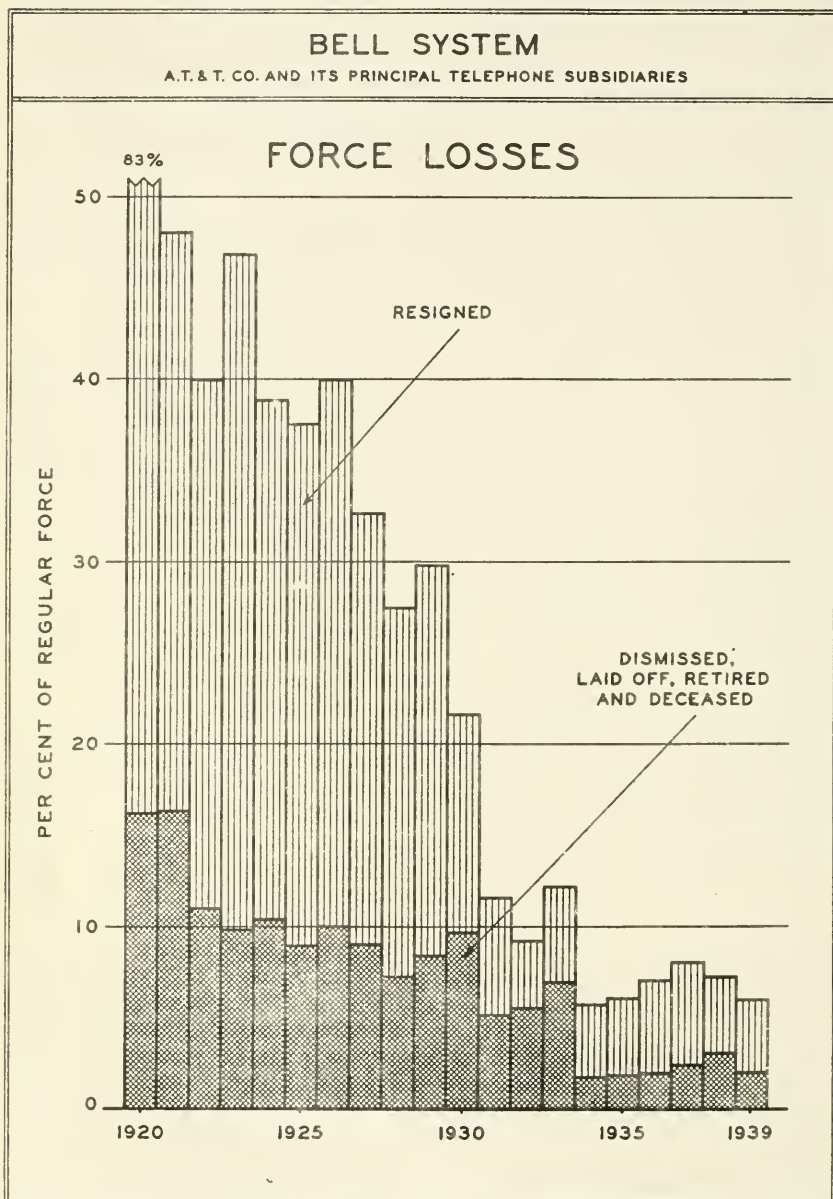
Mr. HARRISON. First, some background is necessary, I think, to comprehend the reason why the rate of pick-up of employees has lagged behind the other items, and I would like to make the observation to begin with that there cannot be any backlog of unfilled orders in the telephone business; the telephone connections between customers must be established promptly, facilities have got to be provided in advance, and personnel has got to be engaged and trained in advance.

Under that obligation of preparedness, and with the heavy demands for service in the 1920 decade, a large construction program had to be carried on to insure adequate physical facilities. In this period, annual gross additions rose from a level of \$200,000,000 at the beginning of the 1920 decade to \$600,000,000 per year at the end of the 1920 decade; in all, some \$3,500,000,000 of construction was com-

pleted as compared with \$1,000,000,000 a decade earlier. The investment in plant rose from \$1,200,000,000 at the beginning of 1920 to \$3,700,000,000 at the end of 1929.

EXHIBIT No. 2571

[Submitted by the American Telephone and Telegraph Co.]



That was the problem of the twenties, getting ready and preparing for that heavy construction program. Then there had to be large numbers of people, particularly new people, engaged and trained.

Dr. ANDERSON. Let me ask a question there. Did this large construction program of the industry in the period of the twenties result in correspondingly large construction crew employment?

Mr. HARRISON. Yes; very specifically, and I have some figures.

Dr. ANDERSON. You will give figures later?

Mr. HARRISON. Yes; I have some figures. I will go on with my prepared statement, if I may, and then discuss it more in detail.

Senator KING. Did you embrace in the word "crew" the manufacturing activities, the number of persons required to construct new appliances, new dials, and what-not?

Dr. ANDERSON. Yes.

Senator KING. So the construction crew includes those engaged in the manufacture of additional mechanical devices?

Dr. ANDERSON. Yes.

Mr. HARRISON. During the 1920's, thousands of new people had to be engaged simply to maintain the existing force. For example, resignations and other normal losses amounted on the average each year to more than 40 percent of the force. The losses are shown in the next exhibit.

(The chart referred to was marked "Exhibit No. 2571" and appears on p. 16646.)

Mr. HARRISON. By the end of 1929 there were 90,000 people—25 percent of the force—with less than 1 year of service, and there were 40,000 people or more during that year who were engaged on construction work, solely for new plant, to provide for the growth that was then coming to us.

Now, the result of all these factors—that is, the large construction program, the training of roughly the 90,000 people with 1 year of experience or less—led to the figure of 364,000 people on the pay roll at the peak of the period. That was clearly an abnormal situation and not an appropriate yardstick with which to appraise subsequent results.

Senator KING. That would be in the year 1920?

Mr. HARRISON. In '29. In 1920 the force turn-over, as I remember it, was 83 percent of the total force; that is, the entire force, males and females.

DISPLACEMENT AFTER 1930

Mr. HARRISON. Now, then, if we can picture the situation as of 1930, when we had just about arrived at the peak of employment, there came a sudden and a sharp drop in demand for new facilities, and there was a slowing up in telephone usage, and to make the force situation more difficult, normal force losses decreased almost overnight, and that is indicated by "Exhibit No. 2571." These changes at once produced a surplus of people, and this situation became progressively more acute.

As the volume of work dropped, adjustments had to be made to bring the forces in line. This was done in an orderly way and with the most careful regard for the welfare of the men and women. Construction during that period was carried on at existing levels, but it soon had to be curtailed as more and more telephones were discontinued and usage was reduced. Intensive sales and other promotional activities were accelerated. Thousands of employees were retained by spreading the available work and other thousands by introducing productive

"made" work. The introduction of new dial offices was reduced to a minimum.

But despite all efforts, work requirements dropped steadily. There was simply not enough work to go around. Had the System released all employees not actually needed, instead of spreading work and providing "made" work, there would have been more than 60,000 fewer employees at the bottom of the depression; this condition prevailed in varying degrees throughout the depression.

I would like to say, too, that throughout all this difficult period of adjustment and of part-timing—and incidentally the entire organization participated in the part-timing—there was the finest kind of cooperation all around.

Representative WILLIAMS. Would you mind explaining what is meant by the term "made" work in this connection?

Mr. HARRISON. That is doing sound, worth-while work that of necessity need not be done at the time, but it is the kind that pretty much we would characterize as advance upkeep work. I don't like to use painting, as there isn't very much of that in the telephone business, but we did things like painting your house a year ahead of time. There are things that an institution might ordinarily defer in bad times; in our case that work was actually brought forward during the bad times, in order to provide work for the people that were on the pay roll.

This readjustment of the force took place gradually, and was spread over a period of years. I think the most significant thing is that the readjustments occurred, not by lay-offs but by not replacing natural losses, that is, resignations, deaths, pensions. As a matter of fact, lay-offs because of lack of work or for other reasons represented a very small percentage of the total force, and were far lower than was the situation during the normal years. That is very apparent in "Exhibit No. 2571."¹ I think the important thing is that the downward adjustment occurred through the medium of not making normal replacements, rather than through the medium of lay-offs.

Incidentally, too, the lay-offs that did occur were regrettable, but they were confined to the short-service people; and for the most part, with the possible exception of some people engaged in construction and engineering work, there were relatively few of the older service employees—and by that I mean service of 5 years and up. We think in terms of an older employee as an employee of 5 years and up, rather than 20 years and up—

Representative WILLIAMS (interposing). In the case of these lay-offs, what, if any, separation allowance was provided?

Mr. HARRISON. Usually—and you will understand when I use the word "usually" rather than be specific, because these operations extended all over the United States—there were separation allowances. They were figured roughly about like this: If by any stretch of the imagination it could be assumed that the individual was entitled to a vacation, even though the year were not up, we started vacation payments. The separation allowance was usually a week's pay for each year of service. If the employee involved had 6 or 7 or 8 years' service, then it became 2 weeks at the sixth or seventh year. In the few

¹ Supra, p. 16646

situations where they had 10 years and up there was specific consideration, which was more generous than the application of a formula.

Representative WILLIAMS. Was there ever any material number of those laid off returned to the service, or was that permanent?

Mr. HARRISON. There were quite a few. I don't have the precise figure on that, but it was the practice as new people were needed in the localities that ex-employees were given the first preference, even though they had been paid separation allowances. As a matter of fact, I know of specific separation cases where they were rehired before theoretically separation payment had run out, but those were incidental.

Senator KING. What proportion of your employees are female?

Mr. HARRISON. At the moment, around 60 percent, and it has been around 60 percent, I think, for the last, oh, 8 or 10 years. It never rose, I believe, much above 63 or 65 percent.

Senator KING. Would they be found in the category of telephone operators?

Mr. HARRISON. A little more than two-thirds, I would say, are telephone operators. The balance are in the accounting and billing departments and commercial departments. Roughly I think at the moment about two-thirds would be in traffic-operating work. Those are round figures. I have the precise figures.

Senator KING. Does it require much of an educational program to qualify them to act as telephone operators?

Mr. HARRISON. Well, sir, the experts disagree somewhat on that, but on the average we think that an employee of 6 months' to a year's service has attained a fair degree of skill in handling the more or less day-to-day run-of-the-mine calls, but they must take on more years of service before they are competent and able to be on their own. I would say that is upward of 3 to 5 years. There is something about the business that one takes on a little breadth of experience more or less each year as you go on, but taking the technical day-to-day operations of handling calls as a routine, I would say 6 months' to a year.

Representative WILLIAMS. I assume you have there somewhere the figures showing the number employed in your construction division and in your operating division?

Mr. HARRISON. Yes, sir.

Representative WILLIAMS. How does that run?

Mr. HARRISON. During the late twenties, when the force was around 340,000 to 350,000, I would say there were 40,000 or 50,000 of those who were involved in the kind of construction related to new business. Now, there is quite a bit of construction that is related to the day-to-day operations of the business—the moving of pole lines, the rearrangements of telephones, changes in that type of thing, but generally a good figure to carry in mind was 40,000 to 50,000.

Representative WILLIAMS. I just wanted a general outline. I believe you have given that, partly, as to what you consider under the construction category in the telephone business.

Mr. HARRISON. I would put it at that figure, sir.

Representative WILLIAMS. I mean, what is the character of the work done?

Mr. HARRISON. It runs, sir, all the way from digging holes to the highest grade of electrical work. It is the labor that is involved in building new plants. There are line crews, the men who install the

telephones, the men who install the cables, the men who install—in a new building we have building terminals and that type of equipment—all of the operations incident to new plant. It is a wide variety of construction work.

Representative WILLIAMS. It doesn't include the construction of the telephone box itself?

Mr. HARRISON. No; we characterize that as manufacturing, and I have not included those figures in my discussion here today.

Representative WILLIAMS. Does it include repair or keeping up of the telephone box?

Mr. HARRISON. Oh, yes; but we don't usually associate that with construction work. The repair, the rearrangements, we talk of in terms of day-to-day operation, just about the same as the telephone operator who puts up and takes down connections.

QUALIFICATIONS FOR EMPLOYMENT IN AMERICAN TELEPHONE & TELEGRAPH COMPANY

The CHAIRMAN. Mr. Harrison, what qualifications do you look for in a new employee?

Mr. HARRISON. Good character first, the characteristics we hope will make them adaptable to meet the particular conditions of work in which they are to be engaged. Of course, the background qualification of technical training depends in large measure on what particular jobs they are going into. I don't know, sir, that I—

The CHAIRMAN (interposing). Well, let's begin with the male employees. What do you require of an applicant for employment? I suppose you would have some persons who ought to be selected for managerial, executive positions, or engineering positions, in which there would be particular prerequisites demanded. Is that right?

Mr. HARRISON. That is right.

The CHAIRMAN. What kind of prerequisites?

Mr. HARRISON. If the work is primarily of the so-called vocational or craft work, for example, the installation or repairs of the telephone, a high-school graduate who has indicated some aptitude for electrical and mechanical work would be considered. Many of the men are graduates of the vocational high schools. If we are looking for a person who must start in more specialized work, for example in the engineering department, he might be an electrical engineering graduate. Frankly, it gets back pretty much to the individual himself, his character, what someone thinks of his promise rather than his particular background training.

The CHAIRMAN. To what extent do you lay down educational prerequisites?

Mr. HARRISON. I wouldn't think, sir, that there are any hard-and-fast rules. In my own case, perhaps, I am glad there were not; I had to go to work before I was able to finish high school. Had there been any requirements laid down, I am afraid I shouldn't have been able to have gotten a job. To get back to my first premise, it is pretty much the individual himself rather than the specific training the individual has had that is considered.

The CHAIRMAN. Do you discuss the attitude of the company toward the older employees in your statement?

Mr. HARRISON. Not specifically, sir, except to say that at the present time the average length of service is now pretty close to 13½ or 14 years. I think that is made up of men 16 to 17 years in service and women around 13 years in service.

Does that answer the question?

The CHAIRMAN. That is merely describing the actual facts. What is the maximum age? Do you have a maximum age?

Mr. HARRISON. I am sorry I misunderstood the question, sir. Yes; we do have a maximum age. We have a so-called pension and benefit plan, and under that plan the maximum age is 65 years. At the age 65 those who qualify—and the qualifications are very generous and broad—the individual is entitled to a service pension.

The CHAIRMAN. On attaining the age of 65, must an employee retire?

Mr. HARRISON. He must; that is a requirement. There has been no exception to that rule as far as I know.

I should like to go back just a moment and then discuss the situation as of 1933 at the low point when the turn came, and I shall try to explain specifically, then, why employees have not increased in relation to the increase of revenues and of pay rolls.

In the first place, we had excess plant. There were 2,600,000 telephones that were discontinued. Obviously, then, there was no occasion for construction. The construction situation was particularly aggravated because construction had been continued through the depression in order to offset as much as possible the down trend.

Then there was the excess force of over 60,000 that grew out of short-timing and made work. That force had an experience factor of about 10½ years; that is, the average length of service in 1933 was 10½ years. In 1929 it was 5½ years' service. There were those three things, the excess in the force, the excess in the plant, and more experienced force. The first problem was to absorb that force; that is, as the business increased. People had to be restored to full time, and by full time I mean 40 hours a week. Then the organization became progressively more effective because it was getting more experienced each year.

I should like to say that during that period there were no new technological changes introduced that might have tended to aggravate that difficult situation.

The CHAIRMAN. That is a very interesting statement, Mr. Harrison. I wish you would amplify it. You say it with such emphasis that apparently you want to call the attention of the committee—

Mr. HARRISON (interposing). Yes, sir—

The CHAIRMAN. In no indecisive terms to the fact that the company pursued a deliberate policy of not introducing technological improvement at a rate that would excessively displace labor.

Mr. HARRISON. During that period.

The CHAIRMAN. During that period.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. How did you come to that decision and why?

Mr. HARRISON. Well, I think the record indicates in the main the consideration the telephone company has always held with regard to its employees. That is evidenced by the relatively few lay-offs. We recognize that we have an obligation and a responsibility to the people we take on the pay roll.

The CHAIRMAN. In other words, you give a great deal of weight to the human factor.

Mr. HARRISON. We do everything we know of to take care of the human equation in the business because we recognize it as important a fundamental in the business as any other element in it.

The CHAIRMAN. How do you carry that policy out? Can you give us an example of holding back the introduction of technological advance?

Mr. HARRISON. Perhaps one that gets more generally into the picture is the dial switchboard. During those low years—I am quoting now rough figures—my recollection is that the dial shipments were reduced to a figure of between 15 and 20 percent of the shipments made in '29 and '30.

The CHAIRMAN. Yet, unquestionably, had you continued to introduce the dials at the same rate you would have reduced your expenses, would you not?

Mr. HARRISON. Yes; we would.

The CHAIRMAN. And from the profit side, from the financial side of your operation, it would have been an advantage to the company.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. But you preferred not to pursue that policy at the price of excessive displacement.

Mr. HARRISON. That is correct, sir. I would like to say, too, that we are on two horns of the dilemma there. There was the choice of continuing the manufacturing phase of the operation and providing work for the manufacturing people as against the proposition of continuing more operating people, and we elected the path that we thought was the soundest at that time. As we now look back on it we think, considered in the light of conditions of those days, it was the sound thing to have done.

The CHAIRMAN. And you were attempting to balance the human factor against the mechanical factor—

Mr. HARRISON (interposing). Senator, there were human factors on both sides. There were human factors on the construction side; we tried to strike the best balance as we saw it.

The CHAIRMAN. That is what I say, you were trying to strike a balance between the human factor and the mechanical factor so that you could obtain the best out of each.

Mr. HARRISON. That is correct, sir.

The CHAIRMAN. Were you holding back progress by doing this?

Mr. HARRISON. During that period we think not, sir. Had that period continued indefinitely I don't know.

The CHAIRMAN. Another story.

How about other devices beside the dial?

Mr. HARRISON. Again, if I might be permitted to take your time, sir, just with a little background, it so happens that, generally speaking, in the telephone business new technological advances are made in the interest of service rather than in the direct interest of reducing the labor content of specific operations. The introduction of those new instrumentalities to make for improved service usually is related to the need of facilities for growth; that is, it has been so in our business. We have not reached the stagnant stage of growth; we have not reached the point where our plant is leveling out; so we have never yet, broadly speaking, had to meet that par-

ticular problem except in the case of specific dial offices. I might say that, generally speaking, the manual office is not displaced until the time has come when some major move is necessary, when some extensive rearrangement or extensive additions have to be made. That is again a generalization; I shouldn't like to have someone hold me to that and say, "Here is example 1, 2, or 3, which is the opposite."

PROGRESS OF DIALIZATION AFTER 1933

The CHAIRMAN. I can understand, for example, a dial system could not operate successfully in a small community with a few telephone connections. There you would necessarily have to retain the manual board. Is that correct?

Mr. HARRISON. Generally, although even there, sir, in the interest of the service advantage we think the dial holds, there generally has been introduced in small communities the so-called dial switchboard, and, incidentally, they are very well received from the standpoint of the service.

The CHAIRMAN. To what extent, if the dial system were completely used, would that system result in displacing manual operators?

Mr. HARRISON. Well, we now have some 60 percent of our telephones that are dial; roughly, I think the precise figure is 58 or 59. We have with our present experience factor roughly one-hundred-thousand-odd operators. We have never attempted to say theoretically if we had been all dial how many fewer or how many less; my notion is—and again I suggest how difficult it is to forecast what the years ahead hold, and doubly so these days—that if and when we reach the time that we have all dials, we will have more operators, because our services that require operators would have expanded, and, as I look ahead, I will be surprised if the number of operators shows any great downward trend, even as the dial increases.

The CHAIRMAN. The actual number. Would it be correct to say that expanding service demands, and will continue to demand, both more dials and more operators, but that the proportion of operators to the outlets or the connections might be expected gradually to reduce?

Mr. HARRISON. Yes, sir. Thinking the committee might be interested, I attempted to find out just what did happen in the last 5 years in connection with the dial displacements; that is, how many people were involved and what happened to them.

The CHAIRMAN. Very interesting; that tells the story.

Mr. HARRISON. I don't know of any other way to go about this thing. In the period from December of 1934 to December of 1939, just taking a period, there were about 1,250,000 stations that were converted from manual to dial. In those particular places where they were converted there were 20,000 people.

The CHAIRMAN. Does a station in your terminology mean the outlet, the telephone connection?

Mr. HARRISON. Yes; telephones, just talking in terms of the telephone. There were 20,000 operators at work at that time. After the conversion there were 9,200 operators; in other words, there were roughly 11,000 displaced. Now there were 5,000 of those 11,000 who were reassigned to other work, either in the same locality or at distant

places. There were 6,000 whom we have classified as resigned or laid off. I don't know the break-down between these two, but the bulk of the lay-offs were those people who were engaged specifically for this conversion work. For the most part they were ex-employees. As a matter of fact, there were specifically 2,500 who did not want a further job, and most of them were given separation allowances. That is the case in that particular situation.

Representative WILLIAMS. In that connection, I notice that you distinguish between those who retired and those who resigned.¹ What do you mean? Do we understand by resign what we ordinarily mean by that, just quit?

Mr. HARRISON. Oh, yes. Preparatory to a dial conversion, plans are generally known 2 or 3 years in advance. There is always a normal turn-over, people are leaving, their families move away or they want to take up household duties or they get tired of their work, or a number of reasons. During this introductory 2- or 3-year period, people are hired, many of whom simply want work for a specific length of time, and those people, I put it, are ready to resign at the completion of that particular job. Many of them are ex-employees who either don't have need to or don't desire to work. It is surprising the number of people who even today resign.

Representative WILLIAMS. I wondered whether you used that in the sense we ordinarily understand by the word "resign," whether they just don't want to work and quit, or whether there is some notice given by the company or some reason on the part of the company for their quitting.

Mr. HARRISON. Well, I dislike to suggest that they all fall in the strict class of what you and I think of as resignations. I think there is some part of them—I think it is a small part rather than a large part—who kind of automatically think in terms of resigning, knowing that that particular job is completed. We characterize them as resignations.

Mr. PIKE. Some of those do get married?

Mr. HARRISON. Oh, yes, and take up home duties.

Dr. LUBIN. Mr. Harrison, you said that between '34 and '39 you installed a million stations on dial.

CHANGE IN CHARACTER OF LABOR FORCE

Mr. HARRISON. No, I think we installed more than that. We displaced roughly 1,250,000 manuals. The actual increase in the dial telephones during that period was greater.

Dr. LUBIN. What was the maximum number of operators the company has ever employed at any one time?

Mr. HARRISON. Before I leave that particular case of dial conversion, if I may, Dr. Lubin, I would like to say that in those same places where there were operators displaced there was about a 20 percent increase in the force of the men to take care of the dial office.

Mr. PIKE. Is that a fair proportion, Mr. Harrison, about half as many operators for dial as for manual exchange?

Mr. HARRISON. Yes; I think it is probably on the low side of the half rather than on the high side, although it varies quite a bit, I

¹ "Exhibit No. 2571," supra, p. 16646.

would say 45 percent that are retained is nearer the figure than 50 percent.

Dr. ANDERSON. You said a 20 percent increase in the force of men was required in the average change-over. Let us have the actual numbers of men, then, corresponding to that percentage. Twenty percent might be a large number or a small number.

Mr. HARRISON. The number at the time was 3,700 and after the conversion was 4,700. Now as to the question of maximum operators, we now have in our traffic force roughly 125,000 people. The bulk of those are operators, I would say about 90 percent, and the balance clerks. At the peak there were 180,000. There are now 125,000.

Dr. LUBIN. A decline of over one-third, or of about one-third.

Mr. HARRISON. Of course, the characteristics as to length of service have changed very sharply in that period. During the period when we had 180,000, a great substantial number of them were employees of less than 1 year's service. Now, as I term it, the average is about 11 or 12 years.

Dr. LUBIN. "Exhibit No. 2570" shows that your decline in total employees has been from approximately 350,000 to about 275,000 or 260,000.

Mr. HARRISON. Did you say 360,000?

Dr. LUBIN. 350,000.

Mr. HARRISON. Yes; roughly that.

Dr. LUBIN. To about 260,000?

Mr. HARRISON. Yes.

Dr. LUBIN. A decline of 90,000. In other words, of the decline of 90,000, 55,000 were manual operators.

Mr. HARRISON. I can give you the break-down of that difference, if you wish, sir. Trying to analyze that for ourselves, as to what brought about that change, we made roughly these figures. Growing out of direct reduction in volume of traffic that we handle (these are all forces now, not just the operators) 26,000 or 27,000 fewer have been employed, about 25,000 fewer, due to the fact that the construction has been reduced and there was no need to build plant. We needed roughly 20,000 fewer learners and instructors, kind of growing out of the function of increasing experience of the force. We characterize one item as easier operating conditions, that is we had never operated where we had the margin in plant that we had, and we put down a figure of 6,000 or 7,000 for that. Incidentally, people seemed to take less time off, less casual time off during that period. We found that equated to 4,000 people. And then the balance is made up of fewer clerks and engineers, people who, for instance, did construction activities, and I put down as the things we could directly relate to technological advances during that period less than 20,000 of the total. About half of that is dial and the other half miscellaneous.

Dr. LUBIN. Has your volume gone down markedly since that peak period?

Mr. HARRISON. Oh, no; our volume, sir, has increased.

Dr. LUBIN. I thought you made an allowance for the fact that you needed fewer people because there was smaller volume.

Mr. HARRISON. I was trying to give the reason for the change from the peak to the bottom.

Dr. LUBIN. I am thinking now from your present figure. Your chart runs up to the end of 1939, I take it, and there has been a decline

in employment of about 80,000 people, and if your volume was greater than it was at the peak you certainly can't attribute any of that loss of employment to loss of volume.

Mr. HARRISON. I am sorry, Dr. Lubin, I thought I had covered that; perhaps you weren't here. Briefly, during that depression period we carried more than 60,000 people in excess of the requirements. That 60,000 was made up of part-timing and "made" work, and the first operation was that that group had to be absorbed. That is the principal reason, plus the fact that the experience factor of the force, the efficiency, grows greater as the experience becomes greater, and the added work has been handled with that slack, so to speak, that was in the force, plus the fact that there have been practically no requirements for construction. Roughly, that explains it.

Dr. LUBIN. What does the Bell System claim is the advantage to the consumer or to the user of the services in the dial phone? I raise that question because we had a dial system installed in this very building several years ago and it didn't last very long, the dials stayed but the operators came back.

Mr. HARRISON. I would like to say, Dr. Lubin, not answering the particular question as to what we claim, but rather trying to state the facts, we know of no way to handle the telephone business without the aid of machines. We don't know how we could have given today's service, leaving out price. We don't know how it could be given with manual operation. I have a more complete statement which I would like to offer for the record which attempts to explain the technical background as to why all manual operation would be just impossible. Now really, I don't belong to the school that is willing to make fantastic figures as to what it might have been had we had none of those changes. I am confident that what we have would not have been, leaving out the question of price. Now there may be some disagreement as to the extent. I wouldn't dare say that you can draw a precise line and suggest that beyond you are doing the right thing and this side of it you are doing the wrong thing. If somebody were to say, "You have gone too fast or you have gone too slow," I wouldn't undertake to dispute it. It is of interest, although perhaps not even worthy of bringing to the attention of the committee, that apparently many other countries in the world have found it necessary to go into the dial, and our rate of introduction has been at a more orderly rate.

The CHAIRMAN. Your rate of introduction of what?

Mr. HARRISON. Of the dial. Really, summing up my statement, sir, the number of employees has increased over the past few years, and as the growth continues, and as telephone markets are further developed, we expect this upward trend will continue. We hope and are confident that more and more people will be needed not only to meet the day-to-day need but also to care for construction.

Dr. ANDERSON. Mr. Chairman, this carefully prepared exhibit that Mr. Harrison has asked to be introduced has been provided in a number of copies, and we ask that the committee accept it as an exhibit.

The CHAIRMAN. It may be admitted.

(The document referred to was marked "Exhibit No. 2572" and is included in the appendix on pp. 17396-17406.)

The CHAIRMAN. Of course, it is clear, Mr. Harrison, that the entire telephone system is a triumph of technology. The telephone itself

was a technological invention which created this great new industry. There can be no doubt about that at all. The only question seems to be the degree to which the expansion of this industry can be fitted into the employment of individuals, and it is quite evident from what you have said as I understand your testimony, that the telephone company has recognized that there is a certain amount of displacement, and bearing in mind the importance of the human factor, the telephone company has endeavored to balance the introduction of new devices against the displacement of individual workers.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And in doing that you have borne in mind not only the specific employment of the workers for the telephone company but also the necessity for maintaining employment among the subsidiaries of the company which manufacture some of your devices and among other manufacturers from whom perhaps you may buy them.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. But the figures and charts which you have introduced here seem to indicate that sometime after the crash, so to speak, in 1929, there came a period when although investment increased and total pay rolls increased and the total number of telephones increased, or the number of stations, and the service itself increased, the increase among the number of employees was no longer apparent. Isn't that correct?

Mr. HARRISON. That is true.

The CHAIRMAN. In other words, there apparently is a point at which the technological advance proceeds at a pace which makes it impossible for employment in terms of individuals to keep up with it. Is that correct?

Mr. HARRISON. Senator, I don't think that is so with respect to our business.

The CHAIRMAN. I am just judging from the material that you have presented.

Mr. HARRISON. I don't believe, sir, that the advance of what we might call technological advances is the factor that is responsible for this precipitous drop.

The CHAIRMAN. I am not attempting to say that any particular factor is responsible. I am merely trying to develop what the fact is.

Mr. HARRISON. Well, the fact is really in our situation that the telephone business can have no held orders, no unfilled business. It has to complete telephone connections as they are ordered. You remember now we had had pretty nearly 50 years of more or less continuous growth, that is in the telephone business. These graphs indicate that, and the growth kept getting faster toward the latter part of the twenties. We had to accelerate the construction program to keep ahead of the needs; we had to accelerate the training program to make available the people 6 months to a year ahead of the time they were actually needed; we had all those goods on the shelf when this drop came. Now, in making the comparison from the recovery, I do think, in looking at the situation broadly, that one has to take into account the situation as of the '29 and '30 period. If you look at that graph,¹ particularly, and look at it in the long-term perspective, it is very clear there that the long-term trend—and the trend has been

¹ See "Exhibit No. 2570," supra, p. 16641.

resumed—is an upward trend and certainly the wages similarly indicate that. I think, Senator, that is best illustrated on the lower graph of this exhibit.

The CHAIRMAN. I think that is quite true, and I don't disagree with that at all. As a matter of fact, I thought I brought that out in some of the first questions—

Mr. HARRISON (interposing). I think you did, sir.

INCREASE OF BUSINESS IN RELATION TO EMPLOYMENT

The CHAIRMAN. That I directed to you. I see that clearly. But this is what I am pointing out. Your revenues are now above the revenues for the peak period in 1929.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. The previous peak period. Your plant investment—that is to say the new capital which you have put to work—is now above the peak of 1929. The number of telephones is above the peak of 1929. The number of conversations is far above the peak of 1929. But only in the case of pay rolls do you find—pay rolls and employees—that you have not yet reached the peak of '29. Your pay roll has increased remarkably, but it has not yet reached 1929. The number of employees has increased very slightly.

Mr. HARRISON. Those facts as you state them are precisely correct, sir; but may I just, at the risk of seeming to be too persistent on this point—

The CHAIRMAN (interposing). You can't be too persistent; let's get the facts out.

Mr. HARRISON. Suggest that this pay roll and these numbers of employees include the day-to-day operation and construction activities.

The CHAIRMAN. Yes.

Mr. HARRISON. Now, day-to-day operations—that is a story by itself. Were construction needs for new business now, thinking in terms of expansion, anywhere near the figures of the '28-'29 period, the figure for employees and pay roll would be quite different from what it is there. They pay roll would be quite a bit up, and the employees, in turn, would be up.

The CHAIRMAN. That is, if you were engaged in the construction?

Mr. HARRISON. Yes; and as you look ahead, we have reason to believe we are going to need more plant.

The CHAIRMAN. That may be. We are dealing now with the facts as they exist.

Mr. HARRISON. That is right.

The CHAIRMAN. And those facts seem to be clear, that in every element of this business, as represented upon the charts which you have produced, the record of the Telephone Co. is far above the peak of 1929 save only in the element of pay roll and number of employees. That is correct, isn't it?

Mr. HARRISON. That is correct. There is no question about it.

The CHAIRMAN. Now, then, you foresee that there may be further expansion.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. There will be necessity for additional construction.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And when that expansion and that construction takes place, you will necessarily have to employ more people.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. But a moment ago I asked you if it would not be the fact that in relation to the number of outlets, in relation to the number of conversations, in relation to the service that you perform, in other words, the number of employees would be proportionately less than they were in 1929.

Mr. HARRISON. That is correct, sir.

The CHAIRMAN. So that we have reached that point in the development of the telephone system where technological advance and efficiency have improved to such an extent that you get more service and more work out of a fewer number of employees. Is that right?

Mr. HARRISON. Yes, sir; but please again may I go back; a fewer number of employees as contrasted with a very artificial peak. I can't, sir, ignore that, because during that period of '39, sir, there was 25 percent of the force with less than 1 year's service.

The CHAIRMAN. You mean by an artificial peak that you had—

Mr. HARRISON (interposing). I mean that was clearly an abnormal situation.

The CHAIRMAN. Let's see just exactly what you mean by an abnormal situation. Looking at the exhibit with the six different charts, the first chart shows the number of telephones.¹ Now, there was a steady increase in the number of telephones from 1900 right through to 1929.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. By "artificial peak" you mean that to handle those telephones in the decade from 1920 to '29 it was necessary to put on more employees than you had previously?

Mr. HARRISON. To get in training, sir, and for construction, to get ready for the business of 1930 that never came.

The CHAIRMAN. Yes; so you put on a lot of new people, is that right?

Mr. HARRISON. Yes, sir; 90,000 of them with less than 1 year's service.

The CHAIRMAN. Well now, that business has since come on, has it not?

Mr. HARRISON. Yes; that business plus a little more, I think.

The CHAIRMAN. So that during these 10 years, the so-called depression years, you have had that business which you had in 1929 plus a little more.

Mr. HARRISON. That is right.

The CHAIRMAN. There was nothing, then, which has operated to prevent you from exceeding the peak of 1929.

Mr. HARRISON. In employees?

The CHAIRMAN. In business.

Mr. HARRISON. No; as a matter of fact, the contrary—we have a little more.

The CHAIRMAN. So that although your business has equaled the peak and then a little more, to use your phrase, the number of employees has not.

¹ See "Exhibit No. 2569," supra, p. 16640.

Mr. HARRISON. Yes, sir; but that difference cannot be charged to technological——

The CHAIRMAN (interposing). I am not charging it to anything.

Mr. HARRISON. I thought, in order to be most helpful, I could give the background of our business. I don't think, sir, that the difference relates wholly to technological advances. A substantial part of it relates to the greater experience of the force. With a more experienced force, you get greater productivity.

The CHAIRMAN. Oh, yes; surely. But bear in mind, Mr. Harrison, that because of your solicitude for your employees you kept 60,000 on the pay rolls during this very 20 years when you might, had you been cold-blooded about it, have dropped them off your pay rolls and obtained the same results.

Mr. HARRISON. That is right, and then we would have shown an increase.

The CHAIRMAN. So that that only emphasizes the conclusion I am drawing from these charts.

Mr. HARRISON. That is true; yes, sir.

Dr. LUBIN. Mr. Harrison, if I may, I hope you will permit me to forget that '29 artificial peak and let's go back to '1923-24.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. "Exhibit No. 2569" shows that the number of telephones in existence increased by about 60 percent between '23 and '39. The number of conversations doubled.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. The plant investment more than doubled.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. Revenues jumped—almost doubled.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. The number of employees remained exactly the same, so that if we eliminate the artificial peak, and go back to a more regular period, that of '23, the fact still remains that with the same number of people you had in '23, you are turning out almost twice the amount of service.

Mr. HARRISON. Of course that is a reasonable conclusion to come to if you assume that the growth and the expansion of the business would have continued had there been no technological advances during that period.

Dr. LUBIN. Of course, I say that assumption plays no part in the picture. The facts are that with the same labor force you had in '23 you are doing twice the business, you are rendering twice the service.

Mr. HARRISON. Roughly, as a matter of fact, I have the thing figured out here. In 1926 we had 40 stations per employee, and now we have about 60, which checks.

The CHAIRMAN. That is the story.

Dr. LUBIN. I would like to ask for my own information, if I might, Mr. Harrison, what is the limitation to the expansion of the mechanical methods of conducting the industry? Does the limitation lie in the market, or does it lie in the investment requirements? Is it a financial problem or a market problem?

Mr. HARRISON. A limitation, Dr. Lubin, in what respect?

Dr. LUBIN. What determines how fast you do move, as it were? Is it the financial investment that is required or is it the market that determines that?

OPPORTUNITY FOR INVESTMENT

MR. HARRISON. I don't know. You see, we have no background of stagnation. We consider this an abnormal period because it occurs once in a lifetime and we are back on our way. From the standpoint of getting money, new investment to care for the growth and to care for the technological improvements, we have been going along, as I see it, at a fairly uniform rate. What would happen when we stopped, whether or not we would go out to get money simply to displace existing plant, I don't know. Trying to answer your question directly, I don't know what is the dividing line.

DR. LUBIN. After all, this is expensive stuff. It runs into billions of dollars, and I take it you people have to make a decision. Is it worth while going out trying to raise additional hundreds of millions now, or shall we wait until the market makes it necessary in the sense that we can't furnish service unless we do do it?

MR. HARRISON. Thinking in terms of the operating man who has to do with the rendering of the day-to-day service, and who is not responsible in the question involved in raising new capital, I don't recall any single instance that capital expenditures thought proper by the operating people were deferred because of investment questions. I am not suggesting that that day may not come but the operating group is, and has been, free to make recommendations to the sound and over-all interest of, first, the service, making the service better; second, things that will make ready the plant, facilities and personnel for tomorrow's service; and third, the things that have to do with the interest and the welfare of the human equation in the business. Those are things in which the operating man has as yet had no limitation of finances. I don't know when that day may come, so I can't answer your question.

REPRESENTATIVE WILLIAMS. As I understand, you have had no trouble about your plant investment policy, securing the funds with which to improve your plant.

MR. HARRISON. That is true.

REPRESENTATIVE WILLIAMS. Has it been new capital or has it been internal financing?

MR. HARRISON. Broadly, I would say that it has been new capital. I don't know the precise make-up, but I would say that for the most part it is new capital.

REPRESENTATIVE WILLIAMS. You know, there has been some talk about its being very difficult for some companies to obtain capital for plant investment, plant improvement. That hasn't been your experience?

MR. HARRISON. No; it has not, sir. As I tried to explain to Dr. Lubin, I am unable to answer the question he has properly projected, because I haven't reached that place in the business.

REPRESENTATIVE WILLIAMS. And it has been largely new capital, rather than the capital that has been accumulated through depreciation and obsolescence?

MR. HARRISON. Yes, sir.

DR. LUBIN. What does that portend in terms of something I hope won't ever happen again, namely, another serious depression? It is quite evident from these figures that after you have kept this labor force at a peak for a period of time there was a gradual decline in

employment and you didn't replace these people. The result was that your costs of operation fell, in the sense that you didn't have these people on your pay roll. Now, as you displace more and more people, put in more and more machines with borrowed money, which means that you have fixed obligations, does that mean that it becomes more and more difficult for the consumer to get service at a lower price because a greater proportion of your costs become fixed?

Mr. HARRISON. Yes; I think that is a broad characterization. I would like, though, to make this one qualification. The labor content of the revenue dollar has changed very little even during the depression years. I think it is very important, that through these years, roughly now, the content, the price that has been paid to labor for day-to-day operations, neglecting construction, now is about 40 percent of the revenue dollar. I think it got down to 39 percent, maybe, 1 year, and got up to 42 or 43. I think right now it is 41. So that I think, looking at it from the standpoint of numbers of employees, looking at it from the standpoint of pay rolls in relation to the revenue dollar, the earnings of individual employees, which is so well illustrated here, it is clear that labor has benefited broadly through the advances of the business.

The CHAIRMAN. That is, the particular persons who were fortunate enough to stay on the pay roll.

Mr. HARRISON. Trying to characterize labor in the broad sense.

Dr. LUBIN. Has there been any change in the hours worked by these people?

Mr. HARRISON. The hours seem to be getting progressively shorter.

Dr. LUBIN. Has there been any shortening of hours in recent years?

Mr. HARRISON. Right now, generally it is about 40 hours. No one works over 40 hours, I think, except perhaps a handful of people who might work in some of the districts where it is still permitted to work 42 hours.

Dr. LUBIN. Bearing upon your last remark to the chairman, wouldn't this shift in average weekly earnings upward in recent years be accounted for in some measure by the fact that as you displace operators the people you retain are in the higher category? In other words, the higher-priced people are kept. The lower-priced people are taken off the pay roll, so that automatically, with no change in wage rates, you might have got an automatic increase in the average weekly earnings of those people who were left.

Mr. HARRISON. Yes, sir; but I think the influence of that on the rise is very small, and I should like to go back and say that over the past several years, now, the proportion of male and female has remained practically constant. Each group becomes more skillful as we get more mechanical devices. The operators who remain have to be more skillful because they are on toll work. They are on the assistant services in connection with the machine switching board, and their skill, and naturally their rate of pay, progressively goes up, and similarly that of the plant craftsmen goes up. Thinking in terms of the supervisory administrative people, the day-to-day administrative people, the foremen, the groups two or three steps above the foremen—they have remained practically constant in number. In relation to the pay roll, they and the administrative forces are sliding down just a little, whereas the vocational forces are go-

ing up. If I were again trying to make some broad characterizations, I would say that through this period the vocational forces have advanced far more rapidly than have either the supervisory or administrative forces. With the exception, sir—

CONSTRUCTION IN RELATION TO GENERAL OPERATION

Dr. ANDERSON (interposing). Mr. Harrison, I wish to mention this artificial peak in '29 again from a different angle because I know it is basic to the discussion that will follow. You gave two reasons for that unusual rise in 1929, amounting finally to some 364,000 employees in the A. T. & T. First, the construction during the twenties moved at an accelerated pace, and therefore made for an artificiality in the number of workers employed in 1929; second, you were accumulating employees in training, ready to take on more business each successive year. You were training them. They were therefore not productive in the sense your regular employees were, but they were being paid while learning.

Now, Dr. Lubin's Department published an article in the Monthly Labor Review for February 1932, in which a breakdown appears, dividing workers into five classes—operators, central office installation and maintenance men, line and construction and installation maintenance, cable and conduit construction maintenance men, and others—and the comparison was made for the period you had reference to, namely 1921–39. I find by running out a computation here on the percentage composition of the 2 years, that there is no alteration. In other words, in construction, proportionately the same number of workers were engaged in 1930 as in 1921, that even when you run up percentages of increase, they are not substantially greatly out of line, and it would indicate that construction work was not unduly stressed in comparison to all other kinds of operations during that time. Would you comment on that?

Mr. HARRISON. Well, I must say that I have difficulty getting away from the facts. The facts were that during 1928 and 1929 our construction program was \$600,000,000 each year. Right now our construction program is \$350,000,000 or \$360,000,000. Back in 1921 or 1922, whatever that period is that you have in mind, I daresay our construction program was quite a bit less than it is today. I may have those figures. So quite apart from the relationships, the facts are quite clear there that in 1 year when you have a construction program of that magnitude, it has some bearing on the force.

Dr. ANDERSON. But thinking of this period of time not only as regards construction increase but operation increase as well, there didn't seem to be a distortion in the direction of construction increase as compared with general operation.

Mr. HARRISON. Might I cite just at that point that in 1920 and 1921 the construction program was less than \$200,000,000. In 1920 it was somewhat under, and in 1921 just a shade over, and I would say that an average of the 2 years was \$200,000,000, and in 1929 and 1930 it was \$600,000,000.

DIVISION OF REVENUES IN A. T. & T.

Dr. ANDERSON. The next point I wanted to ask about was with reference to the point you made of the portion of the revenue dollar that goes to labor. I should like to approach it from a little bit different angle, and refer to some data that I offered you this morning, some that Dr. Kreps has assembled. The sources are given at the base of the table. While I wasn't going to introduce this as an exhibit, Mr. Chairman, I think it bears on the discussion and should go in the record, and I should like to submit it at this time.

The CHAIRMAN. This is submitted as an exhibit prepared by Dr. Kreps and the exhibit shows on its face the sources from which the various figures have been obtained?

Dr. ANDERSON. That is right.

The CHAIRMAN. Without objection it may be admitted as an exhibit. (The chart referred to was marked "Exhibit No. 2573" and appears on p. 16665. The statistical data on which this chart is based appear in the appendix on p. 17407.)

Dr. ANDERSON. I just want to call attention of the witness to several of the columns. They are worked out on indexes with a basis of 1923-25 as 100. Pay roll, you will note, moved to 148 in 1930. Dividends and interest paid moved, however, considerably above that, to 179.

Mr. HARRISON. From what period?

Dr. ANDERSON. The period 1923-25 equals 100.

Mr. HARRISON. Might I just say in that connection that the investment per telephone at that time was about \$170, and the investment per telephone today is about \$275, and when thinking in terms of dividends—

Dr. ANDERSON (interposing). What would that imply, if you would run that difference out?

Mr. HARRISON. The implication is that of course you must have more of what we call net earnings in order to support an investment of \$275 a station as against an investment of \$175, we will say.

Dr. ANDERSON. If you will take the last three columns, you will see both weighted and unweighted productions, and explanations are given. You will note that production increased substantially. As a matter of fact, production shows, in comparison in 1938 with pay rolls, in the weighted averages, slightly less. Employment, however, shows a very decided drop, bearing out in part but accentuating the thing you indicated in your series of charts.

During the period under review, it is your contention that labor benefited proportionately with other claimants on the revenue dollar produced?

Mr. HARRISON. Those are the facts, not my contentions, sir.

Dr. ANDERSON. That labor did benefit proportionately with the other claimants?

Mr. HARRISON. Yes, sir.

Dr. ANDERSON. That dividends and interest did not hold up unusually in comparison to pay rolls paid?

Mr. HARRISON. No, I would rather put it that the earnings available for the investor had taken a downward trend.

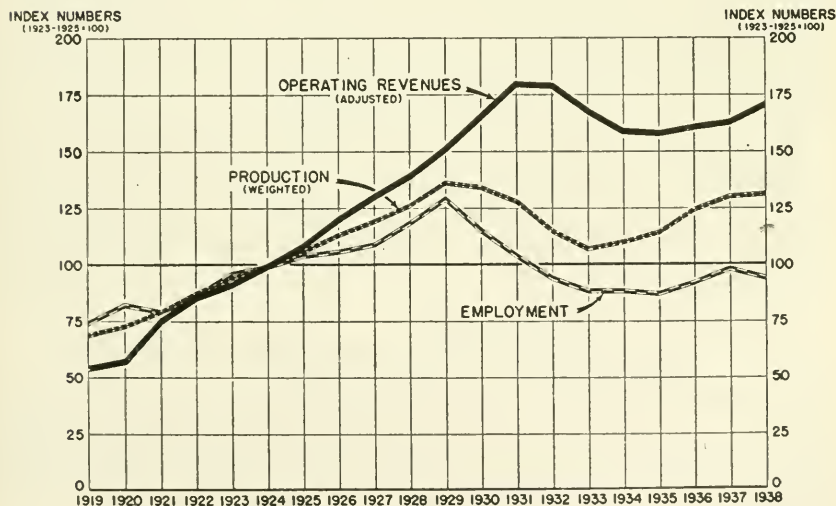
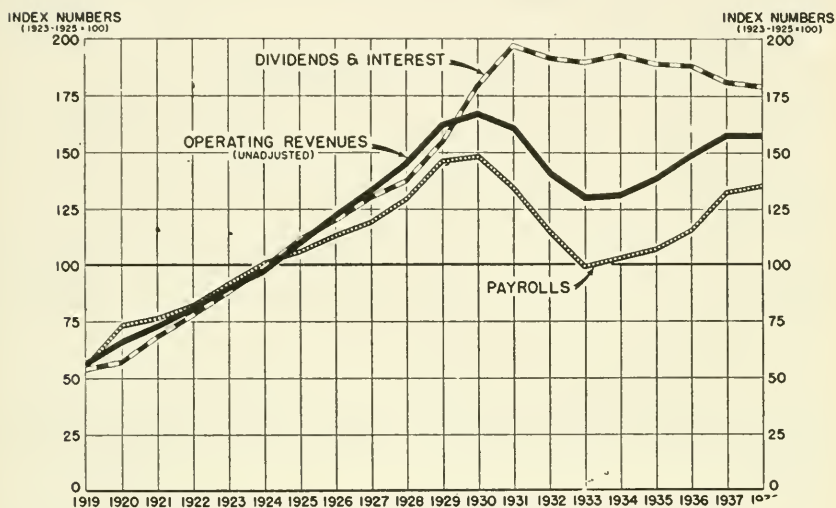
Dr. ANDERSON. Investors' earnings in comparison with pay rolls have gone down?

EXHIBIT No. 2573

PRODUCTION EMPLOYMENT AND INCOME DISTRIBUTED

BELL SYSTEM

1919-1938



SOURCES: EMPLOYMENT and PAYROLLS from American Telephone and Telegraph Company, COMPTROLLER'S ANNUAL REPORT, (Western Electric Company not included)

DIVIDENDS and UNADJUSTED OPERATING REVENUES from Federal Communications Commission, REPORT ON AMERICAN TELEPHONE AND TELEGRAPH COMPANY, CORPORATE AND FINANCIAL HISTORY

INTEREST from ANNUAL REPORT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY

ADJUSTED OPERATING REVENUES by dividing Unadjusted Index by SNYDER'S INDEX OF THE GENERAL PRICE LEVEL.

WEIGHTED PRODUCTION from National Bureau of Economic Research, Bulletin No 59

Mr. HARRISON. No; investors' earnings in comparison with revenues—the relationship of investors' earnings to revenues.

Dr. ANDERSON. That, of course, wouldn't take into account anything that might have been paid out by way of investors' dividends from reserves?

Mr. HARRISON. That is taken into account in all of the earnings.

I think that it might be of interest, Mr. Chairman, to say, now that Dr. Anderson has raised that point, I happen to have here the facts that indicate the earnings in percent of total revenues just keep sliding off a little.

The CHAIRMAN. What is your program now?

Dr. ANDERSON. This afternoon we have Miss Rose Sullivan of the American Federation of Labor, speaking on the same subject from the standpoint of labor involved.

The CHAIRMAN. Do any members of the committee desire to ask a question?

Mr. PIKE. I have one simple question, sir, if you don't mind. I would like to know if you see anything coming on in the technology of the telephone business that might have any widespread effect comparable to the dial phone. Is there anything in the shop that you see? That was a big thing.

Mr. HARRISON. Over a period of years, as you try to look ahead to the day-to-day operations and as you visualize the increasing complexity of the handling of the short-haul toll calls in and around metropolitan areas, for example now there are pretty close to 3,000,000 of those calls a day handled manually, they have to be timed and recorded.

Mr. PIKE. I don't mean more dial installations, but do you see any new invention or device that is on the way that might have a comparable effect on the whole telephone business that the dial did?

Mr. HARRISON. Broadly, no.

Mr. PIKE. The things that may be expected to come along insofar as you can see, then, are the various small devices and changes and improvements, but no great broad basic change.

Mr. HARRISON. All of which progressively will add to the productivity, if you wish, of labor.

Mr. PIKE. You are used to that in all businesses, of trying to do better and better each year, but every now and then comes a big one like this, or like the continuous strip mill in the steel industry, which has quite an upsetting effect. I just wondered if you saw another one coming along.

Mr. HARRISON. We do not; no, sir.

The CHAIRMAN. What is this opportunity for new construction to which you referred? How extensive is that?

Mr. HARRISON. Well, last year we added what we called net additions; that is, really the net increment of added plant to something over \$100,000,000. This year I would expect that it would be more than that. We have used up reasonably well what we call excess margins.

The CHAIRMAN. Excess margins of what?

Mr. HARRISON. Of plant.

The CHAIRMAN. Of plant?

Mr. HARRISON. Yes; and as the business expands we will be back into our more or less normal construction programs.

The CHAIRMAN. In what fields do you see the opportunity for expansion?

POSSIBILITIES OF EXPANSION

Mr. HARRISON. Scattered throughout all the operations, I mean all parts of construction.

The CHAIRMAN. Of course, it all depends, in the last analysis, upon the installation of new stations.

Mr. HARRISON. That is it; it gets back to increased usage either by telephones or calls.

The CHAIRMAN. What opportunity is there for increased usage?

Mr. HARRISON. We think there is good opportunity; that is, our current gains, for example.

The CHAIRMAN. All right; what are your current gains? How do they compare with former years?

Mr. HARRISON. Well, last year, and leaving out a few years that we were recapturing our lost telephones, just leaving those out, last year, as I remember the figures, was our second or third best year from the standpoint of gain in telephones.

The CHAIRMAN. In other words, you have recaptured all of the telephones that you lost in the depression and you have established the second or third best year in the history of the telephone company.

Mr. HARRISON. In gains.

The CHAIRMAN. And that was last year, in terms of gains.

Mr. HARRISON. Now, this year at the start of the year it is just as encouraging as it was last year. What the balance of the year holds is only a forecast.

The CHAIRMAN. In other words, more people are constantly using telephones than ever before. Is that correct?

Mr. HARRISON. That is true; yes, sir.

The CHAIRMAN. To what extent can that continue?

Mr. HARRISON. We in the business, in trying to analyze our markets ahead, are confident, assuming always that business generally is in reasonably good shape, that our gains will continue and we hope at about the current rates. Of course, predictions as to the future are pretty precarious, but we hope, and we have reason to believe, that because of our current gains. I would like to say that we have, contrasted with our peak, about 1,400,000 more telephones.

The CHAIRMAN. You have—

Mr. HARRISON. Now 1,400,000 more telephones than we had at our peak.

The CHAIRMAN. In 1929.

Mr. HARRISON. I think it was the spring of '30.

The CHAIRMAN. That is a very good increase, isn't it?

Mr. HARRISON. Very much so, and our usage is increasing and our prices are going down a little.

The CHAIRMAN. I think the telephone business is distinguished from almost any other kind of business except perhaps the postal service, in the fact that it completes a contact between the institution which offers the service and individual citizens and residents of the country. That is your business.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. You make more contacts with the individual than any other business. It is a straight, direct-to-you business that you are engaged in.

Mr. HARRISON. Ninety million of them a day.

The CHAIRMAN. Just exactly like the postal services. Now it is a striking thing to me that the record which you have testified to here is similar to that of the Post Office Department. You are now describing more telephones in use than ever in history, greater business, greater revenues, and all of that. The postal service testifies to the same thing. Last year in the Post Office Department the revenues exceeded any in the history of the postal department, and the record to date in 1940 points out a still further increase. But while you have this tremendous advance in the telephone system and in the postal system, we still are confronted with unemployment. So that leads me to say that perhaps the telephone company is showing the way to all industry in taking care of the human factor. You have evidently, by the testimony which you have given here this morning, shown that your company has followed a very enlightened policy toward preserving and maintaining employment.

It occurred to me as I was going over your written testimony that it might not be inappropriate if I were to give a little emphasis to two or three points which seem to me to be particularly significant. For example, you said, "I would like to say that since the beginning it has been our aim and policy to introduce improved practices and improved apparatus in such a way as to avoid or minimize adverse effects in the nature of economic waste or human hardship."¹

Later you said, "There have been lay-offs of operators as individual central offices have been converted from manual to dial. These have been scattered," and I am leaving out some. "Everything possible, including long-term planning and generally separation allowances, is done to minimize the consequences of the change-over."²

And also "The introduction of new dial offices was reduced to a minimum.

"But despite all efforts, work requirements dropped steadily. There was simply not enough work to go around. Had the system released all employees not actually needed, instead of spreading work and providing 'made' work, there would have been more than 60,000 fewer employees at the bottom of the depression. This condition prevailed in varying degree throughout the depression."³

In other words, summarizing what you have said, the telephone company has followed the policy of gradual or delayed introduction of technological improvement, of making work, and of long-term planning in order to provide for the absorption in the company of those workers who were being displaced because of the conditions.

Mr. HARRISON. We have done our best, sir.

The CHAIRMAN. Don't you think that that might be a pretty good policy for all industry to follow? Perhaps you don't want to give that advice.

Dr. LUBIN. One question, Mr. Harrison, before we adjourn. What is the relationship between new housing construction and increase in your business? Do you have a definite formula which you use in forecasting?

Mr. HARRISON. No, Dr. Lubin; we don't; but it is very clear that during the depression families had to double up and naturally that

¹ See p. 16643.

² See p. 16644.

³ See p. 16648.

brought about some reduction in the number of telephones, and as people go into their own homes the market for telephones opens up and specifically I think there would be a direct relationship.

Dr. LUBIN. So if we could find some way of still further stimulating housing construction you would feel the effects directly by still greater increases?

Mr. HARRISON. Yes, sir; I am sure we would.

The CHAIRMAN. May I thank you, Mr. Harrison, for your presentation? It was most interesting, and we particularly appreciate the frankness as well as the clearness with which you have discussed these problems.

(The witness, Mr. Harrison, was excused.)

The CHAIRMAN. The committee will stand in recess until 2:30.

(Whereupon, at 12:35 p. m., the committee recessed until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The committee hearing was resumed at 2:40 p. m., the chairman, Senator O'Mahoney, presiding.

The CHAIRMAN. The committee will come to order.

Dr. ANDERSON. Mr. Chairman, the first witness for the afternoon is Miss Rose Sullivan, organizer for the American Federation of Labor, and a person who has had a very long, somewhat exciting career in the field of the organization of telephone operators, extremely well informed, and is ready to present testimony at this time.

The CHAIRMAN. Miss Sullivan, do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Miss SULLIVAN. I do.

TESTIMONY OF MISS ROSE SULLIVAN, AMERICAN FEDERATION OF LABOR, NEW YORK CITY

The CHAIRMAN. Will you give your name?

Miss SULLIVAN. My name is Rose S. Sullivan.

The CHAIRMAN. What are you engaged in?

Miss SULLIVAN. I am general organizer for the American Federation of Labor.

The CHAIRMAN. How long have you held that position?

Miss SULLIVAN. I worked in the labor movement as an organizer for about 20 years, A. F. of L., I. B. E. W., telephone operators.

The CHAIRMAN. Telephone operators and what other?

Miss SULLIVAN. International Brotherhood of Electrical Workers, Needle Trades, in fact pretty nearly every type of industry.

The CHAIRMAN. Before you were an organizer what did you do?

Miss SULLIVAN. I worked for the telephone company.

The CHAIRMAN. In what capacity?

Miss SULLIVAN. As a telephone operator.

The CHAIRMAN. How long were you engaged in that?

Miss SULLIVAN. About 5 years.

The CHAIRMAN. You began when you were young.

You may proceed.

Miss SULLIVAN. I want to preface this by saying that I claim no direct technical experience. This is prepared from the point of view

of the telephone operator and from the union angle concerned with the effects of technological unemployment on telephone operators.

Since early in the 1920's, the operating companies of the Bell System have been making rapid change-overs from manual to machine-switching operation for the handling of telephone calls.

The job opportunity loss has been very great as a result. The statistics supporting this statement are so readily available to this committee I shall not take the time to recite them. They appear in special studies made by the United States Bureau of Labor Statistics (1932) and the Women's Bureau (Dial Cut-Over in a New England City). Although the city is not named, it is the city of Worcester, Mass.

ANALYSIS OF EFFECT OF DISPLACEMENT

Miss SULLIVAN. Unfortunately, this study does not give a true picture of the situation, as the Bureau apparently did not go behind the company's statements, and did not interview representatives of unions or did not run down the validity of the so-called voluntary resignations or the financial fate of the transferred operators.

This Worcester study of the Women's Bureau represents exactly what the company would like to have the public believe happens when a big cut-over from manual to dial takes place. All the employees hired for about 3 years before a cut-over are hired on a "temporary" basis, and so are automatically out when no longer needed. They are supposed to take this very gracefully, and as far as the company is concerned it is just as though they had never been employed at all. As a matter of fact, their employment relationship to the telephone company is exactly identical with every other employee's in their class. They were hired when and because they were needed and are fired when no longer needed. If mechanization had not proceeded, they would continue to be needed and would still have jobs.

They are complete and total victims of technology. Yet, by some strange alchemy of delusion, the telephone company has managed to translate this simple expedient for grinding its own axe into an "enlightened policy" toward technological unemployment and has fooled many persons, including high Government officials, into writing encomiums about it.

Permanent employees who are no longer needed after mechanization also have the most obliging habits of disposing of themselves so that the company may enjoy an enlightened reputation. They all suddenly find husbands or other jobs or win sweepstakes. Anyway, they all "resign," according to the company, at the most appropriate moment, not a day too soon, while they are still needed for the operation of the manual boards, and not a day too late when after the cut-over their presence on the pay roll would be an expense and an embarrassment.

Then there is the group to whom the company gracefully refers as "transferred to other cities." That is not quite as pleasant as it sounds. Worcester is a city running about \$24 a week top salary for operators. A transferred operator would not be getting the top, naturally. Say she is getting \$21 a week, living at home, making her contribution count in the family economy. She is offered a trans-

fer to, say, Bennington, Vt., a city with about an \$18 top. Her service rating under the scale would entitle her to about \$15 a week, a loss of \$9. Maybe she takes it, and maybe she doesn't, but in any case, she shows up in the telephone company as a smiling statistic—"transferred," if she takes it, "resigned" if she doesn't. And don't overlook the fact that if she goes to Bennington, it simply bars a Bennington girl from a job. The overflow from dial offices chokes off employment in the remaining manual offices.

The American Telephone & Telegraph Co., the Bell System, is the largest single employer of women in the United States. In the pre-dial days it took into the system at least 25,000 and possibly closer to 50,000 girls every year. These girls came fresh from school. The company did its own training. This avenue of employment for girls, one of the largest, the requirements simple, good average education, good health, faculties normal, with absolutely no preemployment required, has been completely closed off by dial development.

No young people are being hired for telephone work, and haven't been for over a dozen years, and this is emphatically not a depression phenomenon. It is due to mechanization.

The situation grows worse daily. The operators at present holding jobs in the telephone company used to say, "Well, it will last my time." Now they are beginning to wonder. As more and more manual offices are dial converted the question keeps recurring, "Where are they going to put them?" Only a small proportion are now trained for dial when an office is changed over—eloquent testimony that they are not going to be needed, and not having been instructed in dial, they must resign themselves to being bounced around from one manual office to another as each in turn succumbs to mechanization.

There was a time, even under dial operation, when an operator could feel that she had a breathing spell of job security when she got into a dial office. Understand that mechanization is practically complete. No ordinary calls require any operator service or intervention. Practically the only requirement for operator services in a dial office is (1) to run the cordless B board on which terminal calls from manual offices come in, and (2) ticket calls—that is, calls outside the contiguous or free area. These calls all had to be put up by the operator. You couldn't dial them. The operator had to make the connection and make out the ticket. But not any more. We now have zone dialing and the customer now can dial practically anywhere within his metropolitan area. We used to figure the old rates of displacement as about 1 operator to 6; that is, in the dial we could leave 1 operator where 6 operators had been needed in manual or straight local operating. Now with the zone dialing it is impossible to see how there will be any jobs left at all in dial offices.

The cordless B board, on which calls from manual offices come in to dial offices, is obviously a transition and temporary device which becomes gradually obsolete as more and more exchanges become dial, and need no human factor at all for trunking and switching. The cordless B board is of course semimechanized as compared with the manual B board, and it has a 50 percent increased load performance; but at least for as long as it lasts it affords some small chance for employment in multitasking dial offices. This is only in metropolitan areas which have some dial and some manual exchanges. A single

exchange area or a multiarea with all units dial, does not need the cordless B board.

A word on the cordless B board. An item of expense in the dial conversion is the call indicator board. This board registers calls from a dial to a manual office. For example, when an office is cut over to dial, the existing B or terminating boards from that office to all manual offices becomes useless, they must be ripped out and a call indicator board installed. These call indicator boards in turn become obsolete when the exchange in which they are located becomes a dial office. In an area of, say 50 exchanges, 1 exchange is made dial and 49 call indicator boards must be put in to allow the manual completion of calls from a dial office into a manual office. There is no alternative. The customer dialing cannot complete the call, the existing manual board won't do so because it is based on manual transmission of a call from one exchange to another by an operator, and no operator is involved in the dial office, so a device must be found which will let the operator in the manual office know what numbers the dial station is calling. That, of course, is a great additional expense because these are all installed and all ripped out again as useless after dial conversion.

DISPLACEMENT IN THE BOSTON AREA

MISS SULLIVAN. The Boston metropolitan area now employs between 3,500 and 4,000 operators. When I worked for the Bell Co. operating in that city 20 years ago, 6,600 operators were employed, but that does not tell the whole story of job loss. There has been an enormous gain in telephone stations and in messages during that period. It is one of the heaviest regions in the country for density of telephone development and use.

Based on the number of stations and messages handled by an operator in, say, 1925, at least 12,000 operators would now be required to man this system. This is a job opportunity loss of 8,000 in that one city. This makes allowances for other factors which increase operator value aside from dial operation, such as machine and selective ringing, straightforward trunking, nonrepetition of customer's order, and so forth. Making an allowance for all of that progress, we still have a figure of 8,000 job losses.

THE CHAIRMAN. You make a distinction between an opportunity lost and a job lost by displacement?

MISS SULLIVAN. Surely.

DR. ANDERSON. But you indicate, do you not, in this illustration from one city, that both have occurred in that city?

MISS SULLIVAN. Both job loss and opportunity for job loss; yes, indeed.

DR. ANDERSON. Would you generalize concerning the whole system on that one example?

MISS SULLIVAN. Well, I should say that it runs perhaps about the same throughout the country. I am more familiar with the New England area, because I know everybody there, and we have had organization there, and have had a better chance to keep track of figures. I should say it was pretty much the same in every large metropolitan area. Where business is great, the density of telephone service is great. Of course, in a town like Butte, Mont., where there

aren't as many telephones, and usage and density aren't as great in telephone service, there might be a difference.

However, I think the question of displacement by dial even in the small town might be illustrated by the city of Terre Haute, Ind. Terre Haute, Ind., was an independent company, and had no toll service. The toll service was done by Bell. When they were manual, they had 180 operators; after the conversion to dial they had 12. That is an example of the greatest reduction that I know of.

The CHAIRMAN. Do you object to the introduction of the dial system?

Miss SULLIVAN. Well, my point is that we will not object to the introduction of any mechanical adjunct that is a social service. Naturally, especially in times of depression with so many unemployed, we feel that introduction of machinery should be at least delayed so as not to place an added burden on these people, but we do feel that if we can see some social value to the public, there may be some reason for accepting this great displacement by the machine.

The CHAIRMAN. The statement, of course, is made that the introduction of the dial has been at least somewhat delayed.

Miss SULLIVAN. The point I hope to make here is that the dial has no social value to the public.

The CHAIRMAN. Well, that, of course, is another matter. Have you any opinion or any knowledge as to whether or not there has been some delay on the part of the company in introducing the dial system?

Miss SULLIVAN. Well, I have something on that a little bit further on here that I want to bring out, and I also want to bring out something in connection with that in answer to a statement made this morning by Mr. Harrison, if I may, that "some 60 percent of our telephones * * * are dial; roughly, I think the precise figure is 58 or 59."

I understand the annual report of the A. T. & T. states that out of about 17,000,000 telephones in the United States, 9,000,000 are dial converted, so that would be even greater. That would probably be nearer 65 percent. The city of Newton is being cut over this summer. Three exchanges now employ 250 girls; 60 of these girls are to be trained for dial, according to reports. The remaining 190 will be crowded into manual offices. Somerset-Prospect exchanges, serving the city of Somerville, employing 150 girls, will shortly be cut over. The city of Quincy is the only sizable manually operated office south of Boston in the suburban area. This city will be cut over in the summer of 1941, and over 100 girls now have jobs there. Jamaica exchange, cut over a short time ago, about 80 girls. They needed 12 after the cut-over. South Boston, cut over a few years ago, gave jobs to almost 100 girls before dial. It became simply a few positions on another exchange switchboard. Charleston, 80 or 800 girls met the same fate a little earlier. Within the next year or so, no less than 600 jobs will go, to carry in substitution not more than 100 to 125. All of the city proper is dial-operated, except Quincy, slated to go in 1941, as is all of the south suburban area except a fringe of small exchanges on the border of the metropolitan area. North of Boston within the metropolitan area there are a few manually operated exchanges left, although the city of Cambridge has been dial for several years and Somerville goes out soon.

Outside Boston, all the larger cities are dial operated. Worcester, which gave the telephone company so much pleasant fame for its enlightened policy, used to have almost 300 girls, and now has 100. Cities handling their own toll and long distance, as Worcester does, do not suffer the same job loss, as long-distance work is still handled manually. Worcester handles its own long-distance work. However, the company is taking care of that. Short-haul toll calls are being transferred to local offices and doubtless extensions of the zone dialing principle will soon enable the customer to dial his own long-distance calls.

PBX work is the only job outlet for telephone operators outside the company service. On a board manually operated, if it were at all busy, it was necessary for the PBX operator to have been trained in the telephone company. Such training is less important now. Furthermore, a strong campaign is being made to further mechanize the PBX by installing an internal dial system in large business institutions, hospitals, and so forth.

DIAL SERVICE V. MANUAL SERVICE

Miss SULLIVAN. It is very expensive to install and gives infinitely less satisfactory service than an operator gives, but that doesn't seem to matter. They are going in just the same. The telephone company has competition on this (PAX) but the company is out hard after business. This eliminates about one operator in three on the private branch exchange in this kind of service. It is a nuisance and an abomination, and the customers usually hate it after it gets in, but they have put out so much money on it, they have to stick to their bargain.

An operator still handles out and in calls manually, but internal calls are dialed on another instrument. Imagine in a hospital trying to locate a doctor without the human aid and interest of the operator. Hospitals which have installed the PAX or the telephone company system have to put in a public address system to supplement it, and then it isn't a two-way telephone communication system at all.

The telephone company is therefore abolishing jobs for operators within the service, and at the same time is busy outside, trying to eliminate PBX jobs which company-trained girls might have a chance to get.

Telephone service at its best is personal service. This is true of the PBX as well as of the central office service. To attempt to mechanize PBX service is to render it an inferior service. Yet the telephone company is doing exactly that, just so that it may load up gullible customers with expensive equipment, with the bait that "in time" operator-wage saving will pay for it. Some "businessmen" superintendents of hospitals have been falling for this, but if you want to find out how it is working, don't interview the superintendents—interview the doctors and nurses.

I have shown here in a small way, by casual illustrations, what the machine-switching method has done to operator jobs. The full story is, of course, available in F. C. C. reports since 1934 and I. C. C. reports before that; in special studies by the Labor Department, in the Census of Telephone and Telegraphs of the Bureau of the Census, in the Report on Technological Changes of the National Resources

Commission, and in the extended investigation by F. C. C. into the American Telephone & Telegraph Co.

I suppose I can add my own estimate, and say 150,000 women's jobs have been lost during the last 15 years to the dial. At a \$24 weekly wage, that is about \$10,000,000 pay roll a year, removed as a potential purchasing power and following the downward spiral affecting the silk-stocking trade, the groceries trade, and all the spots where 150,000 girls would spend their wages if they had jobs.

The most appalling picture of all, however, to my mind, is that this job-source is being closed off for all time—not because of the depression—the depression hardly caused a ripple in the telephone business. They only had about a year of really poor business with net station losses. The unemployment casualties which were truly depression-born would have been minor and temporary.

1931 was the biggest telephone year up to then; 1932 was bad and part of 1933, but by 1937 they had reached a new high, largest number of telephones in history, greatest number of messages, best long-distance business, highest profits. Thus the richest, biggest, most powerful corporation in the world is deliberately liquidating its job responsibility to 25,000 American girls every year.

And this brings us to the dial telephone itself. Has it been worth this sacrifice? Has society gained more than it has lost? The dial telephone furnishes a poorer, slower, less accurate, far more expensive service to the public than the manually operated telephone.

It is practically useless in an emergency. It makes more mistakes than the operator does, and she, being possessed or human intelligence, immediately sees her mistake and corrects it.

The service of the telephone operator in every type of emergency, disaster, and catastrophe needs no tribute from me here. It is written on every newspaper page in the history of the last 60 years. That precious element of human quick-wittedness, human devotion, human bravery will go from the telephone system with the last operator, and you will have substituted for it a chill thing of steel, without nerves, emotions, responses, or intelligence. On a manual telephone you have but to lift the receiver, knock it off if necessary, groan if you cannot speak, and on the instant the operator, with all that magnificent mechanism at her fingertips, will act with the speed of lightning to bring aid to safety to you.

The dial? Are you able to dial the operator? If so, you can get her to be sure, but then can you talk to her and tell her exactly where you are? On the manual she can locate you, whether you can tell her where you are or not. On the dial she can't. If you should hang up or have the telephone removed from you and cradled, her chance to help you is gone completely. She doesn't know where you are. You are just an accidental signal on the sender monitor or the unused cord board. If the line had been held open, she might have been able to find out where you were by notifying the wire chief, who might have been able to trace the call. But that chance is lost, and that is hardly emergency service.

I have known operators to implore victims of an accident or assault to remain on the line, to hold the connection open so that, assuming their inability to describe where they were, she could set in motion the cumbersome process of tracing the call through the plant department. But persons distracted by fright or injury or desperation can-

not reason and act coherently. They can't or don't tell the operator where they are, they can't or don't hold the line open, and she is helpless to aid them.

Not so were emergencies handled in the old manual days. A receiver off brought the operator in on the line instantly. She had a sixth sense for human trouble and need. Not a word need be said, a faint groan perhaps, or labored breathing or the shuffle of a body struggling to rise. She knew where it was. There was her familiar little lamp cap with panel and jack plainly marked.

Even if the receiver went back on again, if no coherent word were spoken, she knew she was needed and where and she went into action. The police arrived in 5 minutes and apprehended the assailant. The firemen arrived in 3 minutes and saved the children. A little dog got his picture in the paper in Boston the other day. His master lives in one of the few manual areas left. He knocked the receiver off the hook, the operator went in on the line and heard his ominous barks, preceded by low, prolonged growls.

Realizing that it might just be the postman who inspired the growls, she nevertheless took no chances and dispatched both the police and fire departments to the house. It was a fire; two children were asleep upstairs. The newspaper made the comment: "A good thing it wasn't a dial telephone." This is very unusual, for the newspapers are usually beguiled by company propaganda that the dial is progress.

To substantiate the argument that the dial telephone has robbed the service of one of its most romantic and valiant characteristics, there need only be an examination of the Vail medal awards of the recent years of preponderant dial operation. One year there were no awards at all. No episode worthy of the Vail medal tradition could be found in the entire system.

The Journal of the International Brotherhood of Electrical Workers, the labor organization of jurisdiction in the telephone field, commented on this happening, editorially under the caption "Telephone service at its best is personal service." The Bell System has not since failed to make a Vail award each year, but the awards have increasingly gone for deeds outside the service. A lineman makes a rescue from drowning for instance, a commendable and humane thing, but the act of a passerby rather than that of a telephone man, and only incidentally associated with the telephone service. Needless to say, the Vail medal was designed to memorialize deeds growing out of the operation of the telephone service itself.

Some of the most glorious of these experiences were those of operators in small and remote communities. Under the dial system, the policy is to mechanize these small offices completely, then lock them up and leave them and the community to the strange devices of machinery, with no human eye, ear, voice, or brain on duty for safeguard against any enemy of life or property.

Those are remote-control exchanges, connected to the outside world only through the exchange to which the smaller office is tributary, and that office where flesh-and-blood operators are on duty may be 20, 30, or more miles away.

The telephone-company advertising is very interesting to examine. They never show a dial telephone in their advertising. They stress women, children, and babies in their advertising and, being master

psychologists, know better than to intrude the dial on that picture. A woman with a baby and two or three small children depending on her protection would get very little aid through a dial telephone, if a danger threatened them. The company also, quite unblushingly advertises an operator seated at a switchboard, operating a fully manual board, although they are busy scrapping these boards and these operators as quickly as they can.

At the Telephone Code hearing, under the N. R. A., a telephone-company official was asked when and why and under what circumstances the company determined on dial installation. He replied, after some evasion, that it was usually at the request of the subscribers. I doubt this very much. In fact, I know it isn't true. Despite the terrific build-up which dial has received, customer resistance to it is strong. Every operator knows this.

The calling rate goes down under dial in the beginning; the ratio of abandoned calls goes up. You can't use a dial telephone except in a lighted room. If you wear glasses, you have to find them and put them on. Many old persons, especially if living alone, find the telephone a comfort in keeping in touch with relatives and friends. The dial telephone destroys this, being too complicated.

Dial codes vary from city to city. It is no longer sufficient to know merely the number. You must know and remember the prefixes, sometimes two letters and one digit and sometimes three letters, sometimes letters and one digit, and so on to accomplish the complicated labor of making the time impulse work.

In addition to remembering all the prefixes, you must remember, if the number itself is less than four digits, to dial the number of zeros necessary to make the mechanism work. This is all too much for the aged, the infirm, the partially literate, the foreign, the poor-visioned, leaving this group, to whom the telephone is of special importance, practically shut out from its services.

A phase of the dial question which has received very little public attention is the quality of service it gives. In the *Chicago rate case* it was put forth and supported by good engineering opinion that the dial is incapable of handling an equal number of calls per hour as the manual board. All operators know that the dial is highly susceptible to error. The dial "false busy" is a byword in telephone offices. The importance of timing is such that dialing slowly or more rapidly than normal will result in a wrong number. Dial cut-offs are a nightmare to PBX operators. If your dial falls into a wrong groove, as it not infrequently does, you not only get a wrong number, you can't get a correct number. If you dial 20 times, you still get the wrong number. You can get your call through only by leaving the dial to its own resources and getting an operator to put the call through for you.

I have no qualifications whatever in any technical sense, and my knowledge of telephony is confined to that possessed by an experienced and competent operator. But I have studied and observed the dial in many manifestations, and I believe there are many things which require more authentic explanation than has ever been given by the telephone company.

For example, the New England flood of 1934 affected equally two Massachusetts cities, Lowell and Lawrence. The only obvious difference between the two cities is that Lowell is farther up the river,

and might, therefore, if anything, be more affected by the flood than Lawrence. Lowell had a manual telephone office at that time, Lawrence had a dial.

In Lawrence, the telephone system collapsed completely, and the Army had to set up field telephone service to carry on emergency and relief work. Lowell's manual telephone service stood up to the test in a comparatively high measure of efficiency. The Boston operators could at least get Lowell all through the emergency, but they could not get calls in or out of Lawrence.

The obvious explanation is that the mechanized system, since it could not handle all the load put on it, sagged, buckled, and failed altogether, while the manual system with the factor of human intelligence in control, handled all that was physically possible, which was a substantial portion of the total.

This same phenomenon, which I maintain is characteristic of the dial, occurred when Cambridge, Mass., was cut over. That was the largest single cut-over to that date in the New England area. After the cut-over, there was no service in the city for 2 or 3 days. It just cracked under a load too big to handle. The Boston papers were full of the story. The company said the collapse was caused by curiosity calls, and as usual everybody accepted that.

Now, that could have been true, and if so, proves my point that when loaded with an abnormal demand, whether inspired by fear of death in rushing flood water or curiosity about a new toy, the dial can handle no business at all. On a manual board the operator cannot, of course, handle any more than she is able to, but, as we all know, the capacity of human strength, endurance, and accomplishment, when need requires, is practically limitless.

At any event, in such emergency, the operators can handle loads to the physical possibilities of their switchboards and can apply the indispensable element of discrimination and intelligence. That is, they can give preference to the authorities, hospitals, doctors, and the most affected sections. In short, the situation is within human and rational control. The machine, you see, doesn't know one call from another and can't handle them all. So, in characteristic robot fashion, can handle none and passes out of the picture as a communication medium, usually when most needed.

The cost of the dial reaches, of course, practically astronomical figures. In the *Chicago* and the *Massachusetts rate cases*, this was clearly demonstrated. The New England company sought higher rates in the late twenties, because the cost of the dial installations had disorganized its rate of return. I shall introduce exhibits on these points.

Dr. ANDERSON. Do you want the exhibits introduced here?

Miss SULLIVAN. Yes.

Dr. ANDERSON. These exhibits are extensive documents, and rather than have them printed in the record, we will file them as exhibits.

The CHAIRMAN. You might indicate what you are filing, so that the record will show where they may be obtained.

Dr. ANDERSON. "Exhibit No. 2574" a file exhibit, "The Dial Telephone and Unemployment," from the Monthly Labor Review, February 1932, Bureau of Labor Statistics.

"Exhibit No. 2575", file exhibit, from the Journal of Electrical Workers and Operators, June 1934, "Full Text of Epochal Telephone Decision."

"Exhibit No. 2576", file exhibit, the same journal, March 1935, "Costly Dials Make Subscribers Work."

"Exhibit No. 2577", file exhibit, the same journal, April 1936, "Gifford's Chickens Come Home to Roost."

The same journal for December 1939, "More Glimpses Into Private Life of A. T. & T.", "Exhibit No. 2578."

(The documents referred to were marked "Exhibits Nos. 2574 to 2578" and are on file with the committee.)

Miss SULLIVAN. I have just one more page.

Nobody likes the dial; nobody wants it. It gives inferior service at a very greatly higher price. It is an inconvenient abomination. It is useless in a personal emergency. It cracks up completely in a community emergency. It is nothing that a telephone ought to be and everything that it shouldn't be. It is inanimate, unresponsive, stupid, when telephone service ought to be vital, animated, and intelligent. It does none of the things which machinery is supposed to do in industry. It does not reduce human labor; it merely transfers labor from the operator, who gets wages, to the subscriber who doesn't. It does not cheapen the product, it costs more. It is not more efficient, it is far less useful than the manually operated service. It destroys jobs and closes off an entire employment field, with no compensations to society.

It has been pushed onto the public regardless of merit. When first installed, it could not test consecutive lines. If you had 10 telephone trunk lines and the first line was busy, the party calling you got the busy signal, although 9, 8, 7, or 6 lines might be free. When first installed, it could not measure overtime so that the cost of telephone service could not be equitably distributed among users. These defects have now been corrected.

While the dial was being pushed like mad in Boston, important Massachusetts cities still using the manual were left way behind the times on developments which had long been part of the advancement of the telephone art, such as selective and divided machine-ringing and straightforward trunking. Old ring-down circuits and even old drop systems were still in use in some places, years behind the telephone art, while in other places fine modern common battery boards with straightforward trunking, tandem circuits, automatic ringing, boards capable of many years of useful life, in no way approaching obsolescence and worth millions of dollars, were scrapped for dial, while the other exchanges with the outmoded equipment of the eighties and nineties were left without modernization.

J. J. Carty, A. T. & T.'s great engineer, always opposed the dial telephone and it was not until late in his life when his judgment was overruled, that the Bell System went in for rapid dial conversion.

The dial telephone history has never been adequately studied. No State regulatory body has done anything. The information which has been adduced in State cases has come from litigants and intervenors against rate increases or for rate decreases. The Federal Communications Commission in its investigation of the A. T. & T. apparently did not consider the service angle of dial unless it did so in some staff report with which I am not familiar, although it did consider the cost angle.

The dial telephone is the perfect example of a wasteful, expensive, inefficient, clumsy, antisocial device, being substituted for satisfactory

competent, human labor which received wages for work now performed at exactly the same expenditure of human effort without the compensation of wages.

The CHAIRMAN. If it costs more, Miss Sullivan, to install the dial system, what is the explanation of its adoption?

LABOR DISPLACEMENT AS A PURPOSE OF DIALIZATION

Miss SULLIVAN. Well, that is the question I expected to be asked, and I think the answer is this: The personnel problem in the American Telephone & Telegraph Co. was becoming a very vital one. There was unionization in New England. It was small, but very competent and very militant. The keeping up of the company union is an expensive project for any corporation, and the telephone company undoubtedly saw that this personnel problem would one day be a factor in regulating working conditions, hours, and wages, and therefore went hog-wild on this dial installation, which unquestionably is expensive but which they felt in the long pull—no one knowing how long the pull may be—would reduce their personnel. It has already, by their own charts, reduced the wages of their personnel. It will reduce them by an incalculable amount in the days to come and has also reduced their personnel problem, which is a very real factor in a corporation with a decided antiunion policy.

The CHAIRMAN. Will you pardon me? I have just had a call on a manual board.

(Dr. Lubin now presiding.)

Acting Chairman LUBIN. The testimony given here this morning points to the question I asked, namely, why the dial was installed. This was not of course answered the way you presented it, but the statement was made. I am wondering whether you have any information on the subject, whether it would have been physically impossible to meet the growing demands for telephone service without mechanization. Do you know anything about that aspect of the problem?

Miss SULLIVAN. I would disagree with that completely. A manual switchboard can be installed having up to 10,000 lines, and there is no limitation on the duplication of manual switchboard units. I would say that was definitely not so.

Acting Chairman LUBIN. Do you know whether it takes longer to complete a call on a dial as compared to the manual?

Miss SULLIVAN. All things being equal, I think it probably might be a little faster. I think there would be an advantage in the personal service.

Acting Chairman LUBIN. I know one of the manufacturers of the manual switchboards claims they can prove that it takes less time.

Miss SULLIVAN. Our position is that it takes less time, but I haven't the number of seconds.

I should like to put something in the record in answer to a statement made this morning by Mr. Harrison, of the telephone company, about keeping on 60,000 employees during this long depression. I think that figure of 60,000 is probably true, but I do think mention should have been made that the operators themselves bore part of the burden of that 60,000; that in New England, for instance, work was staggered and many operators—in fact almost all—lost 1 day's

pay a week in order to give additional work to those 60,000 employees. So the cost was not wholly borne by the telephone company, but was borne by the operators themselves—the cost of carrying those 60,000 people.

And I don't believe the telephone company dared to suddenly throw 60,000 people on the streets and say, "This is a result of the dial." It would have been bad for a corporation which spends so many millions and buys up so many pages of magazines with pictures of nice old ladies—I understand there is a nice old lady on the back of the Saturday Evening Post, but no dial telephone beside her. So I would like to leave the thought in the minds of the committee when they think of the 60,000, that the telephone operators themselves also carried part of the financial burden of the 60,000, and in my opinion, I do not believe the company dared to throw that great number of people on the market as an open indication of dial displacement. They would prefer to do that more gradually.

Acting Chairman LUBIN. It might interest you to know that the experience in the United States Senate was to the effect that when the dial 'phones were installed the Senators and employees said they refused to take over the duties of operators, and the result is that although the phones are dial phones, they are manually operated.

Miss SULLIVAN. I think all of you on the committee who dial your numbers are doing the telephone operator's work without wages and without a corresponding lowering of your telephone bill.

Dr. ANDERSON. Viewing the industry as you know it today, could the telephone system of the United States be handled efficiently on a manual operation basis?

Miss SULLIVAN. I absolutely believe that it could be.

Dr. ANDERSON. What is your estimate of the number of operators who would be required in excess of those now employed, were it so handled?

Miss SULLIVAN. At the present time?

Dr. ANDERSON. Yes.

Miss SULLIVAN. I would rather let you make your averages from the figures I absolutely know, and those are the New England figures, which show a loss of 8,000 jobs for the Boston area alone.

Dr. ANDERSON. You indicated a moment ago that labor also bore part of that great burden during the period of the depression.

Miss SULLIVAN. I was speaking there of the New England district, where I know it was done, and I am pretty sure it was the policy throughout the country. In fact it was done here in Washington, too.

Dr. ANDERSON. Do you know whether, during the period of curtailed earnings of the company, the dividend receivers also bore any of the cost there involved?

Miss SULLIVAN. The Bell Telephone stock stayed at 9 percent during all of the depression years, and——

Dr. ANDERSON (interposing). That was regardless of earnings?

EARNINGS OF EMPLOYEES

Miss SULLIVAN. The A. T. & T. stock dividend was \$9, and has been all through the depression, regardless of earnings. Before we had a depression in the telephone company at all, in the year 1930

and '31, when the company was doing well, all increases in the telephone industry were stopped. A moratorium was declared on increases, and this was in the very best year of the company, 1930-31, and all increments, all raises, were frozen, and no further increases were given for a period of 3 or 4 years.

(Senator O'Mahoney assumed the chair.)

Dr. ANDERSON. This morning, Mr. Harrison submitted "Exhibit No. 2570" which showed the average weekly earnings of all employees. I take it you have seen that exhibit?

Miss SULLIVAN. Oh, yes; that was a point that I heard Mr. Harrison make this morning. I think he said that the wage scale, if anything, was a little higher than it had been some years ago. I would like to point out that naturally when no new people have been hired over a period of 15 years, you reach your top salaried people, and in the event of the cut-over all those who are hired and let go as not needed would be the low-wage persons, and of course those who have had 10, 15, or 20 years' service would be the higher-paid people, and comparing that scale, it would look as though the wage scale were a little higher.

Dr. ANDERSON. There is one other comment I should like to ask for on this matter of employees' weekly earnings. You will note he has a single line on the chart indicating the average for all employees. You have devoted most of your paper to the effect of dial upon operators. If you put in a line here indicating operators' earnings, do you have any data that would indicate to the committee what operators have earned in weekly earnings during the period under review?

Miss SULLIVAN. I have many wage scales in my office and I should be very glad to submit them to you for your report.

Dr. ANDERSON. This would indicate that the average weekly earnings for telephone employees—and I take it this being all employees, it includes Mr. Gifford's salary as well as the lowest-paid operator in the system—all averaged, amounted to something like \$37 a week. In the district you know best, what are the average earnings of operators?

Miss SULLIVAN. The telephone scale for telephone operators is \$26 at the end of 15 years in the big cities. In cities like Chicago and New York it goes up to \$28, occasionally to \$30. There are graduated scales. They have class A, B, and C, and down to an \$18 or \$21 top. There is no scale in vogue for every telephone operator. It begins with the metropolitan areas and goes down to the smaller areas, and there are six or seven or eight schedules.

Dr. ANDERSON. What would be the lowest schedule?

Miss SULLIVAN. The lowest might be around \$16 or less—that is, comparable to whatever the minimum is in a very, very small town or village, a small exchange, but top would be, in New York City, \$30.

Colonel CHANTLAND. Is that beginners?

Miss SULLIVAN. No; that is after 15 years. There has been no beginning rate, because the company has closed the schools for the last 15 years. There have probably been no telephone operators hired, excepting when a cut-over comes, and they hire an enormous amount of temporary people, and give them around \$14 or \$16 beginning rate.

Colonel CHANTLAND. Even in the large cities?

Miss SULLIVAN. Yes; as a beginning rate.

Mr. PIKE. Those are a good deal higher than they used to be. I used to work for a telephone company at \$15 a month as an operator.

Miss SULLIVAN. I was a member of the first telephone operators' union in New England, and we do take credit, in the International Brotherhood of Electrical Workers and the Telephone Operators' Union, for all of the good wages and good working conditions now enjoyed throughout the telephone system. We fought for these conditions and struggled and bargained for them, and the telephone company then automatically put them into effect throughout the system. So beyond any question, we can demonstrate the fact that what is considered by the company today a fairly good policy in hours and wages is the result of the telephone operators' union. In fact, we had to threaten strike in New England at the time of the N. R. A. to get 46 hours' pay, or to get 48 hours' pay for a 46-hour week, then 44 and 42, and finally a 40-hour week with the 48 hours' pay, but that was no generous gift from a concern that didn't know quite where to put its undivided surplus lest the Government take it. It was something we had to frighten out of them in order to get it.

The telephone company buys all its equipment, from a pencil to a switchboard, from the Western Electric Co., which is a subsidiary of the American Telephone & Telegraph Co., and it is therefore buying from itself and selling to itself, and if it makes a nice little profit that can go over to Western Electric Co. as a melon. That is a very nice way of doing business. You have no competitors in your equipment, and the price is whatever you wish to make it.

Colonel CHANTLAND. Miss Sullivan, you make this statement, that it doesn't reduce human labor, it merely makes the subscriber do the work, who doesn't get wages.

Does your memory run back to the time when the Bell Telephone Co. itself used the argument against the independents who had dial telephones?

Miss SULLIVAN. I believe it does.

Colonel CHANTLAND. It was one of the hardest arguments the independents had to go against.

Miss SULLIVAN. At that time the Bell Telephone Co. didn't have the patents, and the dial was all wrong. Now they have the patents, and the dial is all right.

Colonel CHANTLAND. In other words, the Bell Telephone Co. at that time said it was a nuisance and "you don't want those telephones with that nuisance on them."

UNIONIZATION IN THE A. T. T.

Dr. ANDERSON. You spoke a moment ago of the effect of unionization and the collective bargaining upon the wage rate of telephone operators, taking credit for the increase as a result of unionization. What is the practice in the A. T. & T. with respect to unionization and collective bargaining?

Miss SULLIVAN. The telephone company at great expense has set up a company union. They were one of the first industries in the company-union field. They have this organization superimposed upon the operators, and now with the imminence of dial and the threat of loss of jobs, it is pretty hard to get people out from under the domination of the company and the company union.

Dr. ANDERSON. So the company union operates within the A. T. & T. as the dominant bargaining group?

Miss SULLIVAN. I have never known of them to bargain. If they do any bargaining, it is news to me.

Dr. ANDERSON. In other words, the effect a union of that kind might have upon technological advances in the industry would not correspond to the effect your union as an outside bargaining agency has?

Miss SULLIVAN. Congress has decided that a company union is not a legitimate union and is therefore out-moded and made illegal, so we hold there is no union in the Bell Telephone System, and I feel the threat of a real union that would have some say as to hours, wages, and working conditions is one of the deciding factors in the promotion of the dial.

Dr. ANDERSON. Is your attitude with respect to the dials being unsocial and all the other things you characterized it as being, your personal view or that of your union and its representatives?

Miss SULLIVAN. That is the view held by all telephone operators whom I know, and I know many thousands of them. It is also the view held by people who have made a study of the dial itself, and have not been beguiled by the telephone company's advertising.

Dr. ANDERSON. Have you ever opposed any other technological change the Bell Telephone System has installed?

Miss SULLIVAN. No; we were in favor of their straightforward trunking and certain earlier things such as tandem switching and machine-ringing, and so forth, which improved the service.

Dr. KREPS. I should like to ask the witness a question which is probably somewhat academic, but it is alleged that machines are introduced because of high wages, and whenever wages are raised you increase the pace of mechanization. On that point I should like to ask you two questions out of your experience. In the first place, did machine technology coming into the telephone industry, particularly the dial telephone, displace low-paid or high-paid workers? And in the second place, if there were differences in pay of the operators displaced, did it tend to displace workers who got higher pay as opposed to those who probably, in outlying districts or in other districts of the country, got lower pay? In other words, was there a tendency for the dial system not to be put in, say, in the South or West, where wages were lower, and to be put in specifically where wages were higher?

Miss SULLIVAN. The expansion of the dial was greater in the North, and wages in the North—telephone wages—are generally higher. So I think that it might be that the drive came in the North, where wages were higher, and it is my convinced opinion that the telephone company has rushed the dial at great expense and inconvenience to the public because they foresaw a problem where organization in the field of the telephone industry would mean a higher wage for their employees.

Dr. KREPS. Among the employees of the telephone company itself in an ordinary telephone exchange was it the relatively high-paid employees that were supplanted or the low paid?

Miss SULLIVAN. We had established a policy, with 10 years of unionism in New England, that has been pretty generally followed by the company, and that is that in lay-offs or transfers, length of service

shall count in holding your job. The newer employees, those with the shorter length of service, and therefore with the lowest pay, will be the first to go. That is a union principle.

Mr. PIKE. Of course, the displacement wouldn't hit the supervisors and chief operators as much as people who had been doing regular work on the board, would it?

Miss SULLIVAN. When it eliminates an operator it eliminates a supervisor and a chief operator. Take, for example, the small exchange that has become completely automatic. When that is closed and turned over to the devices of the machine, there will be no plant chief, wire man, telephone operator, information operator, supervisor, or chief operators.

Mr. PIKE. That wouldn't be true in the larger city.

Miss SULLIVAN. It will eliminate the higher-paid people, if you are thinking of supervisors, chief operators, and people of that sort, in proportion to the number of operators eliminated. If there is 1 supervisor to 10 operators and you eliminate 100 operators, you eliminate 10 supervisors and 1 chief operator.

Dr. KREPS. Could you have delayed the installation of the dial system by lowering the wages of the operators?

Miss SULLIVAN. I do not believe that it was the high wages, because the wages are comparatively not high. I believe it was the personnel problem that the company foresaw in the future, especially with the National Labor Relations Act. They realized they could not forever hold their people in a company-dominated union, and when they would get into a real labor union, they would have to face the problem of better wages and better conditions. I think that was the situation they wanted to sidestep, and not any high wages they now have.

Dr. ANDERSON. You now have a situation in which well over one-half of the industry has been mechanized with dials—some 60 percent, as I remember your remarks.

Miss SULLIVAN. Yes.

EMPLOYEE ATTITUDE TOWARD THE DIAL

Dr. ANDERSON. Obviously, it is impossible to turn the clock back. Is it your opinion that the union will continue to resist further installations of the dial on the grounds you have stated in this paper?

Miss SULLIVAN. We see no reason, since there is no social value to the public, to the employees themselves, for this tremendous job loss that exists and that will continue to exist as dialization is extended.

Dr. ANDERSON. And you therefore urge a return to the manual operation of the telephone service?

Miss SULLIVAN. We urge at least the cessation of the dial installation.

The CHAIRMAN. You mean the—

Miss SULLIVAN (interposing). The cut-over; and I still feel that the public was better served by the operator.

The CHAIRMAN. You were speaking a little while ago about the temporary employees of the company, the operators. Can you amplify that a little bit?

Miss SULLIVAN. About 3 months before the cut-over takes place, it is necessary to have an additional force of operators, and the telephone

company will point out this fact to the subscribers and say, "Why, we not only don't let our people go, we hire more."

The CHAIRMAN. Why is that necessary?

Miss SULLIVAN. There are many factors. The operators must be taken from the board for periods of time and taught the dial operation, and therefore it will be necessary, on the manual, to have others take their places. So for a period of 6 weeks, we will say, the number of operators who are to be retained in dial must be taken from the board and trained in dial operation, and someone must handle the boards while they are not there.

Then the general excitement and change due to any cut-over would require additional operators, but that is for a very short period, and the company, of course, because they write "temporary" beside their names when they give them jobs, does not enter them in the statistics at all.

The CHAIRMAN. We have been told that those who are displaced by the dial system are, for the most part, temporary employees of that character. What is your view about that?

Miss SULLIVAN. That would not be so, if we will assume that an exchange has 100 people and that after the cut-over they are going to need 20, or less.

The CHAIRMAN. Is that a proper proportion?

Miss SULLIVAN. That is about the proportion. Sometimes it is 6 operators displaced to 1 girl on the dial. It might run down to 14 percent, but we will assume the most advantageous, one-fifth, 20 people to remain out of 100.

The CHAIRMAN. Would you say that on the average the installation of the dial system reduces employment?

Miss SULLIVAN. It takes four-fifths, at least.

The CHAIRMAN. Of the operators?

Miss SULLIVAN. The operating force—I am including information operators, supervisors, chief operators.

The CHAIRMAN. I understand.

Miss SULLIVAN. Shortly before the cut-over, in this 6 weeks to 3 months period, an additional 10 percent is taken on. That would be 10 operators are hired, making the force 110 to carry them over this training period, so that when the girls are laid off, finally, after conversion, 90 go. That is 80 of the old girls, plus the 10.

The CHAIRMAN. That must include many more than these temporary employees.

Miss SULLIVAN. Eighty percent of the force, plus the 10 percent taken in during the conversion.

The CHAIRMAN. We heard testimony to the effect that the company has adopted as a policy the delay of installation of dials, has adopted a policy of making work and long-range planning in order to absorb those who are displaced by the introduction of devices like the dial. Have you anything to say about that?

Miss SULLIVAN. The company is being as careful as possible not to get an unpleasant odor abroad among the people by sudden, spectacular displacement of telephone operators.

The CHAIRMAN. I take it that there is some effort to do this upon the part of the company, but your feeling is that it doesn't go far enough.

Miss SULLIVAN. That is true.

The CHAIRMAN. In other words, that the policy isn't sufficiently enlightened, that it may be partially enlightened.

Miss SULLIVAN. Where there is a great deal of toll service, the displacement of telephone operators is not so great. A two-thirds displacement instead of three-fourths, four-fifths, or five-sixths.

On the machine in the telegraph industry, may I introduce the president of the Commercial Telegraphers' Union, who is a testing and regulating plant man here in Washington, D. C., for Western Union, I should like to have him give some testimony about the machines in Western Union.

The CHAIRMAN. That is part of our story.

Colonel CHANTLAND. Did you read or hear Mr. Harrison's testimony?

Miss SULLIVAN. I heard the last 10 or 15 minutes of Mr. Harrison's talk.

Colonel CHANTLAND. He spoke of a separation wage based on a vacation plus, I believe, a week per year of service for the first 6 or 7 years, and 2 weeks for each year of service above that, as a separation wage that they paid these displaced people. Is that substantially correct?

Miss SULLIVAN. Well, I think the separation wage is for some of the older employees, those, for instance, who have 15 or 20 years of service. I have not heard of it as far as telephone operators are concerned, for what the company terms the temporary 10 percent group, nor is it, in my opinion, a general practice for the younger group.

Colonel CHANTLAND. He didn't claim it for the temporary, but anybody that was on the regular roll—whatever vacation they were entitled to, plus 1 week more for every year of service up to 6 or 7, and 2 weeks' pay for every year of service above 6 or 7; that that was paid as a general practice, I believe he led us to believe.

Miss SULLIVAN. I do not believe that that is a general practice. I am not aware of it.

Dr. LUBIN. Do you know whether that is the practice in the Boston area?

Miss SULLIVAN. In the Boston area the union is strong, and we have been able to keep our people moving around the manual offices so that no one has been separated from the job.

Dr. LUBIN. What is the attitude of the union in those instances where a new exchange is erected? Would the union feel that new exchanges should be manually equipped?

Miss SULLIVAN. In the face of 9,000,000 dial telephones out of a possible 16,000,000 or 17,000,000, and the company's policy—it seems to me that it wouldn't be very important what we thought. The public is going to get the dial whether they like it or not.

Dr. LUBIN. You did say that what the union really wants is that they should stop making conversions.

Miss SULLIVAN. We believe that if they started tomorrow on their new equipment to reestablish manual operation, it would be better for the public and for employment.

The CHAIRMAN. Have you discussed that with the company?

Miss SULLIVAN. No, I haven't, personally. But I believe that where our representatives are bargaining collectively, the company is well engaged in.

Dr. ANDERSON. This morning we were given testimony to the effect that last year's operations were the highest in the history of the telephone company, that there is every prospect, with the movement of business forward to higher levels, that the telephone company will also reach higher levels of production and operation; and incidental to that higher achievement will come substantial increase in employment; that the prospect is, therefore, one in which, while technological advance will be noted, it will be not detrimental, and will increase the number of workers engaged in the telephone industry. Would you care to make any observation on that point?

Miss SULLIVAN. I should say that until we are 100-percent mechanized, at the rate of existing expansion and telephone use, there will be some additional operators taken on, but even then I would question whether the company would be able to take care of all of the remaining operators who will be displaced and who are now operating manual boards. I doubt if it will take care of this group.

Dr. ANDERSON. Do you see any prospect, then, of the telephone industry's becoming, as it once was, a place of new entrance to the labor market, to the extent, as you indicated, of some 25,000 girls a year during the twenties, who will find employment in the immediate future?

Miss SULLIVAN. I see no possibility of that. I think that opportunity has gone forever, and that at the present rate of progress of the dial, it will reach the stage in a few years where the service will be thoroughly and completely mechanized, that there will be a minimum of employees, not only operators but plant and installation.

The CHAIRMAN. Are there any other questions to be addressed to Miss Sullivan? We are very much indebted to you, Miss Sullivan, for a very clear presentation.

Miss SULLIVAN. I should like to present Mr. John W. Reynolds, of the Washington, D. C., Commercial 'Telegraphers' Union.

(The witness, Miss Sullivan, was excused.)

The CHAIRMAN. Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. REYNOLDS. I do.

TESTIMONY OF JOHN W. REYNOLDS, COMMERCIAL TELEGRAPHERS' UNION, WASHINGTON, D. C.

Mr. REYNOLDS. I only have one copy of this. You may have it after I read it.

The CHAIRMAN. Let's get you identified.

Mr. REYNOLDS. John W. Reynolds, Commercial Telegraphers' Union.

The CHAIRMAN. What is your position with the Western Union?

Mr. REYNOLDS. I am the assistant automatic chief of the Western Union Telegraph Co.

The CHAIRMAN. And your position with the union?

Mr. REYNOLDS. I am president of the local in Washington.

The CHAIRMAN. Thank you.

Dr. ANDERSON. And the local is an A. F. of L. local?

Mr. REYNOLDS. Yes, sir.

Since the time Samuel Morse sent his historic message of "What hath God wrought?" until the present time, Western Union has been the dominating figure in the written word communications. At first it was made up of numerous small telegraph companies which finally banded together and formed what has been for the last 50 years known as the Western Union Telegraph Co.

TECHNOLOGICAL CHANGE IN TELEGRAPHY

Up to 1912, about 95 percent of all telegraph sending and receiving was done by Morse, operating in the term of "pounding brass." With the exception of crude machines which fed out a tape when the distant Morse operator was sending and made ink lines on the tape in the form of the Morse code which was later deciphered by a Morse operator and written down, automatic telegraphy was little known in this country. It had been experimented with in the laboratories of Europe and developed to a semipractical stage.

In the years of 1912 and 1913 automatic telegraphy began to show itself in the Western Union in the form of Barclay machines and perforated tapes which sent and received the written word, laboriously to be sure, but nevertheless it was automatic, and the operation did not require the skill of the old-time Morse men.

At the beginning of the World War in 1914, the Multiplex appeared, and is the basis of all automatic telegraphy that is used today. By means of distributors, relays, and the duplex theory, multiple sendings and receivings could be produced on a single wire simultaneously. With the increased volume of business due to the war, a faster means of transmission and reception was imperative to the telegraph company, and the Multiplex was the answer. Little by little the Morse operator was pushed aside by experienced typists who could learn the routine and system used by the telegraph company and extra lists of Morse operators began to appear.

When the United States became involved in the war, the volume of telegraphic file was enormous, and even the Morse operators found employment in their chosen field. Employment in the communications field remained at its height until the post-war period, when improvements in the automatic system again began to show on the horizon. To give the devil his due, the Western Union willingly trained all Morse operators who were willing and able to learn the new system, but naturally there were some old dogs who could not learn the new tricks, and they were shunted to the extra list to make whatever time they could when excess help was needed in their line of work.

In 1924 the telegraph business was still in a state, but more and more the automatics were eating up the Morse facilities and in that year the teletype or Simplex reared its head and by 1926 Western Union had concentrator units of this new machine. This pushed the Morse telegraphist farther in the background and Morse telegraph jobs became a problem. The teletype or Simplex was used on branch office lines and short-way lines in concentrators which had fixed positions for each line wire, and later a plan was devised whereby the individual office was placed on a turret comparable to a telephone switchboard. Any operator in the concentrator unit could plug in any office whose light happened to flash on the board as a call. This concentrator unit had lights and signals which would point out to the

supervisor the location of any idle operator, the operator next to take a call, the number of unanswered calls, the number of busy operators and the exact location in the unit of all idle operators. All during this progress in the automatic field, the Morse telegraphers were dwindling, until 1929 when about 90 percent of the Morse telegraphers were working outside of the telegraph companies. They had, of necessity, to find jobs in the brokerage offices, newspaper offices, baseball parks, and bucket shops. There was little need of Morse telegraphers in the biggest corporation in the telegraph field. Those who could learn the new system, either the Multiplex or the Simplex, were retained, and some are still able to earn a living as combination automatic and Morse operators. There are at the present time, according to reports, 20,000 telegraph employees unemployed, working part-time, or employed in other work in almost every city in the country.

During the depression and up until the present time Western Union has been experimenting with various technological devices, most of which are not a benefit to the service or the public but a direct effort to eliminate manual labor in the telegraph field. The service itself has suffered, until Western Union is losing revenue because of some of its supposed improvements. Western Union has what is known as the Multiplex-Simplex repeater, a device which comprises a portable table on wheels which can be connected with adapters on any trunk circuit, and give direct service to any branch having a teletype machine. At first glance this would seem to be expediting business, but when it is found that Western Union encourages false routing of business to eliminate using the natural relay for business, then it is a detriment to good service. Suppose, for example, that the Western Union branch in this building has 10 messages for Chicago. The Multiplex-Simplex repeater is placed on the Chicago trunk wire in the main offices, and those 10 messages are transmitted to Chicago. That is good service; but in the meantime the clerk at the counter has taken over about 30 more messages. Those 30 messages are sent to Chicago, regardless of where they are going, and in that unnatural routing, it is eliminating jobs in the main office at Washington.

Dr. LUBIN. May I interrupt there? What do you mean? If this telegram is addressed to New York, would it go to Chicago and back to New York?

Mr. REYNOLDS. Absolutely. They have direct service to Chicago, and the operator is working on that line. I have an example showing that business for Jacksonville, Fla., has been sent to Chicago, then back to Atlanta, which has a direct line to Jacksonville, so that in the round-robin of service you have lost time, an element important in good telegraph service, just to use the relay.

The delay entailed in such operations is the cause for losses of file by Western Union. These adapters have been placed on most trunk circuits in the Washington office, so that it can be seen that most of the branch office file could be routed away from the Washington main office, thereby creating a false impression as to the density of the business in the Washington area.

In 1937 a reperforator was installed in Richmond, Va., and, despite the reports of the company to the contrary, 70 percent of the entire personnel lost their jobs. It was claimed that they were transferred

to other jobs at other points in the system, but 70 percent of the entire personnel either lost their jobs entirely or were transferred out of the city to be put on the unemployment list of other towns or part time in another city in Western Union. There have been reports that most of the personnel of the Richmond office was taken care of, but of the five who were supposed to be transferred to Washington to take care of their loss of jobs, we found only one who was finally reported to Washington, and he was a service clerk and was put on the bottom of the list subject to part time or to be fired at the first time there was a drop in business in Washington.

The reperforator consists of banks of relays, transmitters, and automatic equipment designed to eliminate jobs. Instead of the message being printed on a tape and gummed by an operator as before, it is received in the form of a perforated tape with the printed message above the perforated tape, and is switched to its destination at the switching center and placed in a transmitter by the receiving or switching operator. One operator in a switching center can take care of the same number of wires that four operators formerly worked, thereby eliminating three operators. The switching center operator must now also be a route clerk. She must note the destination of each message she receives and what wire to plug it into, thereby eliminating the route clerk's job. This procedure eliminates jobs even down to the timekeepers. Where it formerly took two timekeepers to keep the time in the Richmond office, there is now only one because of the unemployment caused by the installation of the reperforating system. It would seem that with this wholesale eliminating of jobs, the company could afford to pay the remaining employees fabulous salaries. They have reduced their pay roll way down, and those who are left should, if you come down to a common-sense principle, get more money if they are handling more business, but the pay roll for the Richmond office hasn't increased.

The CHAIRMAN. You say the company is getting more business?

Mr. REYNOLDS. No. I have some figures on the business.

The CHAIRMAN. I understood you to say that just then. Did you mean that?

Mr. REYNOLDS. No.

The CHAIRMAN. I misunderstood.

Mr. REYNOLDS. No; I said that the employees with the same amount of business with less help should get more money for the work performed.

The CHAIRMAN. You are speaking of the amount of work done by the employee?

Mr. REYNOLDS. That is it. In other words, formerly an operator handled 75 messages on one side or the other of the wire; now she handles 375. Surely the operator should get part of the revenue from these 375 messages.

Dr. ANDERSON. When do you fix the time of change? When did she handle 75?

Mr. REYNOLDS. Before the perforator, which went into Richmond in 1937.

Dr. ANDERSON. So it is a very recent change?

Mr. REYNOLDS. Yes. The money spent on such mechanical devices was earned by those who were eventually let out, so it would

seem that the hard work performed by the Richmond personnel, for instance, would finally lead to the loss of their jobs.

The next installation of this robot which eliminates jobs is Atlanta, Ga. Western Union workers in that town are becoming panicky because of the results in Richmond. Atlanta is the biggest Western Union office in the South, and is the division headquarters for the company. Is there any wonder why these people are becoming hysterical and wondering when the axe is going to fall and cut off 75 percent of their personnel?

Next came the dial system. This is also very recent. It was originally intended to be fast and direct service between railroad terminals to distant main offices, thereby eliminating relays which are bad on short-haul business. For instance, if you go to the Union Station and file a message to a person at Baltimore saying you are going to arrive in Baltimore 45 minutes later, if that message was sent through the regular channels, going through the Washington main office, to the Baltimore main office, to the addressee in Baltimore, it would take considerable time, and with the fast train service you get now you would reach there before the message. This dial was primarily set up so that you could dial Baltimore and send a message without any relays, but Western Union also has taken advantage of this to defeat the employment problem by routing over the dial business which has to be relayed after it has been sent to the railroad terminal.

For example, Union Station, Washington, has a message for Philadelphia, and the operator at the Union Station dials Philadelphia and gets them; she sends the Philadelphia message and has several more on hand, not for Philadelphia, but she sends them anyway because her chart or instructions tell her that if she is in connection with Philadelphia, also to send Pittsburgh, Cleveland, and Detroit business. This eliminates the main office procedure in Washington, which has direct trunk lines to all three of those cities.

The company is now experimenting with a facsimile machine whereby you write out your message, put it in a slot, pay the fee, and it comes out in the handwritten copy at the other end. The actual service now is worse than it has ever been because of the deficiency of help. If less than adequate force is maintained, the Western Union will continue to lose business because of its so-called technological improvements which are a detriment to the public service and the employees as a whole.

MR. CHANTLAND. Why is this Washington operator told to put these Pittsburgh and Detroit messages at the tail end of a Philadelphia message to Philadelphia? I don't understand that.

MR. REYNOLDS. It eliminates a relay through Washington, and in that way if the Washington force is kept at a minimum, making it impossible to cover those channels without outside help.

DR. LUBIN. Does it mean, on the other hand, at the same time that you have to have more people in Philadelphia to relay that on to Detroit?

MR. REYNOLDS. It is possible, yes; but the natural relay for that business is Washington, D. C., and if the company has a force at Washington, D. C., to take care of that, why send it to Philadelphia? Eventually if you send enough business, you are going to eliminate your Washington operator.

Mr. CHANTLAND. Do you gain any time by that? If you had the force at Washington wouldn't it be quicker to send it out of the Washington office?

Mr. REYNOLDS. My contention is yes, sir; but it is a saving in money and salaries to the telegraph company.

Mr. CHANTLAND. The telegraph company is supposed to mean speed, isn't it?

Mr. REYNOLDS. Absolutely.

Mr. CHANTLAND. Which is the speedier if they ran it right?

Mr. REYNOLDS. Naturally the routing to Washington and sending it on a direct trunk line. The facilities are here to meet those conditions. Why shouldn't they be used?

(Dr. Lubin took the Chair.)

Acting Chairman LUBIN. Are there any questions the committee members wish to ask?

LABOR DISPLACEMENT IN THE TELEGRAPH INDUSTRY

Mr. REYNOLDS. The chairman asked for these data, which I have here:

The Fifth Annual Report of the Federal Communications Commission gives a partial picture of the unemployment in the telegraphic communications industry, which indicates that the loss of employment and employment opportunity in this field has been terrific during the so-called depression period, 1930 through 1938. Briefly, the picture presented is this: At the close of June 1930 there were 92,658 employees in the industry, while in June 1938 there were only 63,411 employees, which is a job loss of 29,247.

It cannot be argued that this actual loss of jobs is attributable to loss of business by the companies, for the same report shows that during this same period the number of revenue messages transmitted has shown a decided increase from 188,776,653 in 1930 to 196,551,582 in 1938.

Acting Chairman LUBIN. Are there questions of the witness?

(The witness, Mr. Reynolds, was excused.)

Dr. ANDERSON. This morning we introduced a chart which I ascribed to Dr. Kreps' authorship, and it has such bearing on the problem we have been discussing today and will still be discussing tomorrow we have asked Dr. Kreps to explain it to the committee.

Dr. KREPS. This is "Exhibit No. 2573".¹ It might well be called the pattern of idle funds and unemployment due to distortion of the stream of purchasing power. The chart is in two portions.

Acting Chairman LUBIN. Dr. Kreps, will you refer to the exhibit number?

Dr. ANDERSON. 2573.

Dr. KREPS. The top portion of three lines represents dollar figures. The heavy line shows the operating revenues collected from the public, collected, of course, in this case from millions of households in small monthly amounts. The bottom line indicates what happened to the stream of funds put back in the form of mass disbursements to labor, namely, pay rolls. Notice that the trend is continuous throughout the period. During the entire period from 1919 to 1938 receipts from

¹ Supra, p. 16665.

the public have tended to outdistance what was disbursed back in the form of mass purchasing power to labor. Both, incidentally, are expressed in terms of indexes. In the accompanying table¹ I give the actual figures upon which these indexes are based and the sources of the data.

Notice also that disbursements to stockholders in the form of dividends and interest, shown by the broken line at the top, reached a peak in 1930 and have remained high throughout. There was a question asked earlier today why technological improvements are introduced if they don't mean appreciable reduction in cost. The answer in part is that businessmen are always on the lookout for a place to earn high returns on surplus funds. Technological improvements even when they fail to reduce costs are highly desirable if they provide a profitable outlet for funds. They take this dollar that comes in and get more of it into the hands of the owners. Machines are put on the pay rolls instead of labor, for about the same reason a manager often puts his son or other relative on the pay roll.

CONCENTRATION OF OWNERSHIP IN AMERICAN TELEPHONE & TELEGRAPH CO.

Dr. KREPS. The net picture, then, is one of increasing disbursements in the hands of those who receive dividends and interest. If those were mass disbursements, no particular distortion to the flow in the income stream would be caused, but when it is remembered that even in this company, which excels in the distribution of stockholdings and public favor which it enjoys, less than 5 percent of the stockholders own more than one-half of the company, it is quite clear that the top line does not represent mass purchasing power.

Mr. PIKE. Is that true? I thought they said that no stockholder owned as much as 1 percent.

Dr. KREPS. That is correct. To own 1 percent of a corporation which has an asset value of \$2,500,000,000 is tantamount to saying nobody has as much as \$25,000,000 invested in this one stock.

Mr. PIKE. Senator O'Mahoney just before he left gave some of the figures here that just came out. As I remember, there are about 18,000,000 shares of stock—what I mean to say is that you gave me the impression when you said 5 percent—

Dr. KREPS (interposing). Of the stockholders own more than 50 percent of the total stock.

Mr. PIKE. Yes; that is right. My misunderstanding.

Dr. KREPS. The exact figures are contained in a report of the Federal Communications Commission. Five percent is about 34,000 to 35,000 stockholders, I believe.

Mr. PIKE. I shouldn't have spoken at all.

Dr. KREPS. The picture is one of steadily accumulating idle funds at the same time that you have an instrument at work constantly subtracting funds in small monthly amounts from millions of householders, funds which are not distributed back to as large a number or in such small amounts as collected. That distortion of the stream of purchasing power, of the income stream, is one of the most fundamental facts deserving the consideration of this committee.

Acting Chairman LUBIN. Isn't it true, however, that since 1932 the tendency has been reversing, that is, the index numbers representing

¹ Appendix, p. 17407.

revenues going down and the index of pay rolls going up? In other words, you are getting them close together, closer than they formerly were at the bottom of the depression?

Dr. KREPS. There has been some change, not so much since 1932, but since 1937. As you remember, there have been some rate reductions.

Acting Chairman LUBIN. But in 1933 your index of pay rolls was 100 and now it is 130, and in 1933 your index for interest and dividends was about 190 and now it is about 176, so they are coming closer together again, aren't they?

Dr. KREPS. They are beginning to, that is right, although the spread is still substantial.

Mr. PIKE. Well, they stayed pretty well together until the end of '29.

Dr. KREPS. That is due in part to the fact that '23 to '25 has been used as a base. The tendency to diverge existed throughout the period but was accelerated after '29.

Mr. PIKE. The divergence is there, but the trend is fairly well the same, and wouldn't you think that those last 2 years of interest and dividends going up in even a sharper trend represented what Mr. Harrison spoke of this morning as being the momentum in planning for business that never did show up? They did increase their plant, as I remember it; they raised a lot of money in '29 for plant and put it in the plant, and with the unchanged dividend rate the dividend and interest would go up. Wouldn't you think, to a great extent, that represented expectation that operating revenues would go up and they just didn't? As he also said this morning, they pretty well used up their surplus plant, and the using up of that surplus plant, it seemed to me, to some extent is shown by what Dr. Lubin just spoke of, the operating revenue and the pay rolls, both going up again. It isn't at all sure that they will meet, but I think there may be a great deal of that in that 2-year lag. They used to plan pretty far ahead. They planned wrong in this case.

Dr. KREPS. The bottom portion of the chart shows not dollar figures but what might be called real values. The heavy line depicts what the community had to surrender in the way of goods and services in order to get the dollars it used to pay telephone bills. Technically, it is the index of operating revenues adjusted for the value of the dollar in all its uses, including the payment of pay rolls. It is the index of the general price level devised by Dr. Carl Snyder of the Federal Reserve Bank of New York. The middle line shows service rendered. This is what the community got in the way of telephone service; it gave up what is represented in the heavy line, showing that the exchange value of telephone service went steadily upward. It commanded a larger share of community goods and services than it did before. More had to be surrendered. The community had to work harder for the same unit of service. All the technological change that took place did not enable the community to command telephone service with less effort. None of the great increase in technological efficiency of the company was transmitted to the public in terms of lower prices to a sufficient extent to make telephone services cheaper relative to other things.

Acting Chairman LUBIN. Just what do you include in production?

Dr. KREPS. There are two measures. In the table both the weighted and unweighted figures are given. One is the weighted average of exchange and toll messages of the Bell System as com-

puted by the National Bureau of Economic Research and published in its Bulletin No. 59. The other is based on average daily conversations as reported in the Federal Communications Commission special investigation.

Acting Chairman LUBIN. I don't see how you conclude that we had to give up more goods and services. All you are saying is that the revenues went up faster than the service created.

Dr. KREPS. Adjusted revenues went up faster than the service created.

Mr. PIKE. It would be really adjusted cost to the consumer.

Dr. KREPS. That is right. This represents what the consumer had to surrender in the way of real effort.

Mr. PIKE. Purchasing power.

Dr. KREPS. Purchasing power; how hard he had to work. It is similar to the familiar example of the farmer who has a mortgage to pay. Wheat at \$1 a bushel and a \$1,000 mortgage means he has to raise a thousand bushels of wheat. If wheat goes down to 50 cents a bushel he has to raise 2,000 bushels of wheat. That is exactly the idea underlying this comparison. You have in the middle line a physical measurement of the service which the telephone system rendered the community. The top line gives a physical measurement of the sacrifice which the community had to go through in order to command the funds necessary to pay the bill. At the bottom is represented the employment created, the amount of work, the amount of outlet for the energies of the community which was afforded by the telephone system. Notice that employment, as has been testified by Miss Sullivan, went down steadily.

Acting Chairman LUBIN. Is that actual number of persons employed or man-hours?

Dr. KREPS. That is actual number of persons employed.

Dr. ANDERSON. Thereby it would be a crude measure only. If you had man-hours you would get even a sharper picture, would you not?

Dr. KREPS. Yes; that is correct.

Mr. PIKE. Those are figures Mr. Harrison gave this morning.

Dr. KREPS. These data, incidentally, are all taken from the reports of the company.

The significance of this chart is that it pictures in a nutshell the fact of technological advances not passed on to the public.

Mr. PIKE. It is reaped by the shareholders.

Dr. KREPS. The benefit of technology is clearly one that the shareholders reaped.

Mr. PIKE. I think the bondholders would tell you they didn't get much.

Acting Chairman LUBIN. Are there other questions?

Do you have any other witnesses?

Dr. ANDERSON. Not this afternoon.

Acting Chairman LUBIN. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon, at 4:20 p. m., the committee recessed until 10:30 a. m., Thursday, April 18, 1940.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

THURSDAY, APRIL 18, 1940

UNITED STATES SENATE.
TEMPORARY NATIONAL ECONOMIC COMMITTEE.
Washington, D. C.

The committee met at 10:50 a. m., pursuant to adjournment on Wednesday, April 17, 1940, in the Caucus Room, Senate Office Building, Representative Clyde Williams, Missouri, presiding.

Present: Representative Williams (acting chairman), Senator O'Mahoney (chairman); Messrs. Pike, Lubin, Hinrichs, O'Connell, and Brackett.

Present also: Boris Stern, Department of Labor; William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; and Dewey Anderson, economic consultant to the committee.

Acting Chairman WILLIAMS. The committee will please be in order.

Dr. ANDERSON. Mr. Chairman and members of the committee, we propose with this morning's witness to finish the testimony on the communications industry, and this afternoon we have a witness who will speak more generally on the problems of technology as they are affected by electric power. The witness this morning is Mr. Paul E. Griffith, president of the National Federation of Telephone Workers, Chicago, Ill.

Acting Chairman WILLIAMS. Do you solemnly swear that the testimony you are about to give in this matter now pending shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. GRIFFITH. Yes, sir.

TESTIMONY OF PAUL E. GRIFFITH, PRESIDENT, NATIONAL FEDERATION OF TELEPHONE WORKERS, CHICAGO, ILL.

Acting Chairman WILLIAMS. State your name.

Mr. GRIFFITH. My name is Paul E. Griffith.

Acting Chairman WILLIAMS. Your residence?

Mr. GRIFFITH. I live in a suburb of Chicago, Ill.

Acting Chairman WILLIAMS. What is your business and background, Mr. Griffith?

Mr. GRIFFITH. I began with the Bell System in 1922, and since then have been employed in various departments of the Bell System; the Western Electric inspection department; Western Electric engineering department, the group that is now the Bell Telephone Laboratories; Western Electric factory at Hawthorne in Chicago, as a dial switch man for the Illinois Bell Telephone Co., and an engineer for the Illinois Bell Telephone Co.

Acting Chairman WILLIAMS. What is your present position?

Mr. GRIFFITH. I am an engineer for the Illinois Bell Telephone Co. and president of the National Federation of Telephone Workers.

Acting Chairman WILLIAMS. What is this federation?

Mr. GRIFFITH. The federation is an organization of telephone unions in the telephone industry throughout the country, including the operating, manufacturing, and research departments of the industry. You will note I said "industry," not just the Bell System.

Acting Chairman WILLIAMS. I notice you did not include construction. Is that included, also?

Mr. GRIFFITH. That is included also; yes, sir. You use the term "construction" in a little different sense, of course, than we do. The federation includes all phases of the telephone work in the industry.

Acting Chairman WILLIAMS. You represent your federation, composed of workers in every branch?

Mr. GRIFFITH. That is correct.

Acting Chairman WILLIAMS. Of the telephone industry?

Mr. GRIFFITH. That is correct, including, as I said, manufacturing and research.

Acting Chairman WILLIAMS. What is the number of the membership in that federation?

Mr. GRIFFITH. We have 110,000 dues-paying members at the present moment.

Acting Chairman WILLIAMS. And you have been selected as the president of that organization?

Mr. GRIFFITH. That is correct.

Acting Chairman WILLIAMS. You may proceed.

Mr. GRIFFITH. I would like to congratulate you gentlemen on your fortitude in listening to all of this maze of testimony and figures that you have in past days. I think it is remarkable, and speaks well for your sincerity.

As spokesman for the National Federation of Telephone Workers. I wish to express to the members of this committee our appreciation for this opportunity to present our views on the impact of technology on employment in the telephone industry.

Our general view is that we are not opposed to technological advance to the extent that it contributes to the improved and increased use of telephone service. In the approval of technological changes, however, the National Federation of Telephone Workers is of the firm conviction that the telephone worker and the telephone subscriber should share equitably in the economic benefits of such changes, and the job security of the worker should be a vital and important factor of every step.

Technological advance in the past has created unemployment of a considerable magnitude in the telephone industry. It is anticipated that the extension of improved methods and equipment already in use, and to be introduced in the future, will progressively reduce the number of labor units required to build and man the telephone plants.

Such curtailment of employment opportunities by this economy in labor necessarily results in social hardships to the telephone worker, his family, and community. We are reminded here of Edwin Markham's words, "Why build we these cities great, when the builder we forget?"

We submit for the consideration of the committee a number of facts and opinions pertaining to this problem in the telephone industry. We appreciate that they are in some respects incomplete and of provisional character. The very nature of the problems arising out of the failure of employment to keep pace with technological advances upon labor is such as to make quantitative analysis and evaluation difficult in the absence of intensive research far beyond our present resources. We believe, however, that this fact should not be permitted to interfere with an accurate survey of this problem as it applies to the telephone industry. We therefore, pledge our cooperation as a labor organization to this committee in this work. We appreciate, as we know the committee does, the need of fairly considering all factors and all of the various interests involved.

While some of the points we appear to rely upon are opinions instead of facts, we urge their serious consideration, first, because they represent the opinions of thousands of intelligent and educated telephone workers, with a background of experience which embraces the years during which the telephone industry developed from a minor to a major position in the United States; and second, because we are certain that subsequent study will, in virtually every case, bear out these opinions.

The subject should be viewed with a keen interest, as most telephone companies are of themselves utilities supplying interstate and local telephone service to the public in practically every community of the United States. We recognize that the telephone companies comprising this industry are subject to various local, State, and National regulatory bodies, whose specific purpose is to establish and prescribe fair and comparable rate regulations. These commissions, however, do not concern themselves with good or bad policies on labor economics.

I will repeat the sentence, These commissions do not concern themselves with good or bad policies on labor economics.

In outlining the fact, and our views, on the impact of technological advances on employment in the telephone industry, we have confined ourselves to what we believe to be reliable statistics on the operation of certain telephone carriers of the United States, assembled from time to time by separate bureaus or commissions of Government. We believe these exhibits will show the merit of our opinions on this subject.

REDUCTION OF EMPLOYMENT

Mr. GRIFFITH. There has unquestionably been a decline in the total number of employees in the telephone industry with relation to the total number of stations and investment, as shown in the three exhibits.

Incidentally we have a total of eight exhibits we should like to introduce as a part of this record.

Acting Chairman WILLIAMS. The first three exhibits may be received.

(The tables referred to were marked "Exhibits Nos. 2579 to 2581" and are included in the appendix on pp. 17408-17410.)

Acting Chairman WILLIAMS. Do they all indicate the source of the data given?

Mr. GRIFFITH. They do. It will be seen from these tables that the number of telephone carriers have decreased from 140 in 1926 to 73 in 1938. This has been the result of corporate merger or consolidation.

Acting Chairman WILLIAMS. What do you mean by carriers? I don't happen to know what the number of carriers means. What is that?

Mr. GRIFFITH. A telephone company is a telephone carrier. They are designated so in the statistics. A class A carrier is a company with an annual income of \$100,000 or more.

Acting Chairman WILLIAMS. That simply means a telephone company then.

Mr. GRIFFITH. That is right.

They decreased from 140 in 1926 to 73 in 1938. The depreciation reserve for the industry has been continuously bettered, as its ratio to investment in telephone plant has steadily advanced from 20.23 percent in 1926 to 27.52 percent in 1938. This is a 7.29 increase in 1938 over 1926. Under capitalization the tabulated columns reveal a decrease in debt ratio to total capitalization, from 27.67 percent in 1926 to 19.4 percent in 1938.

Mr. PIKE. There is a point there, Mr. Griffith, I would like to ask you about. That funded debt right through, I take it, is almost all owned by the public. Is that not generally true? There is very little funded debt owned across between companies?

Mr. GRIFFITH. It is my opinion that you are correct.

Mr. PIKE. Whereas in the capital stock a great deal of it includes capital stock of the operating companies, which is owned by American Tel. As near as I can make out from the totals, there must be substantial duplication.

Mr. GRIFFITH. The American Telephone & Telegraph figures are included in these figures. These are figures for the entire industry.

Mr. PIKE. Yes; but they don't represent merely the capital stock that is held by the public, but they represent, let us say, a subsidiary company having \$10,000,000 of stock issued all owned by the American Telephone, that is in as \$10,000,000, and then the \$10,000,000 that the American Telephone Co. had to issue to buy that stock is also issued. When you get up to \$4,000,000,000 you get to a total which is something twice the total of the American Telephone stock outstanding, so I think there must be a whole lot of duplication here, inter-company ownership.

Mr. GRIFFITH. It may be so, I couldn't say.

Mr. PIKE. Maybe Dr. Anderson could answer that.

Mr. MAGINNIS. May I ask the witness where he obtains his figures that are used in this?

Mr. GRIFFITH. We show on the footnotes that we secured them from the Fifth Annual Report of the Federal Communications Commission, for the fiscal year ending June 30, 1939.

Acting Chairman WILLIAMS. Proceed.

Mr. GRIFFITH. While the total surplus has decreased considerably from the high figure of 1931, it still remains a substantial figure, well above that shown for 1926. Your attention is directed to the

fact that declared dividends have always been constant even during the depression years.

The ratio of operating expense to operating revenues has been very consistent, the extreme variation being from a low of 66.95 percent in 1928 to a high of 71.44 percent in 1933. Net income has been good although somewhat variable. A consistent annual gain is shown in the totals for wire mileage.

It will be seen that the total number of telephones in service increased steadily until 1930, when a sharp decline is noted. This decline in total telephones in service continued until the depression low point was reached in 1933. The 1930 peak of telephones in service was approximately regained by 1937, and definitely surpassed in 1938.

These tables further indicate that the volume of business, shown as the average number of calls originating per month, quite closely followed the total number of telephones in use. There was a steady increase until 1930 and a decline until 1933 as before. By contrast, however, it should be noted that the 1930 peak in business volume was surpassed in 1937 and a new all-time high established in 1938.

We would like to note here the following comparison taken from "Exhibits Nos. 2579, 2580, and 2581."

	Year	Total tele- phones	Number of employees at close of year
Normal year.....	1926	14, 371, 922	322, 526
Depression low year.....	1933	14, 293, 251	267, 129
Difference.....		-78, 671	-55, 397
Normal year.....	1929	16, 978, 590	387, 023
Service recovery over past high point.....	1938	17, 431, 353	285, 550
Difference.....		+452, 763	-101, 473

From the foregoing it is evident that the number of telephone employees at the close of each year shows an economy in labor entirely out of relation to the telephones in service and the volume of business handled by the industry previous to 1929.

Mr. HINRICHS. You refer to 1929 as a normal year and for many lines of business 1929 was regarded as an exceptionally high year. Would your tables indicate that as far as the telephone business is concerned it moves rather evenly from 1 year to the next so that 1929 was not a year of exceptional activity?

Mr. GRIFFITH. During 1929, 1929 was not considered exceptional. It was only considered exceptional when later events showed it to have been a peak.

Mr. HINRICHS. The growth, in other words, from year to year had been more or less consistent through that period.

Mr. GRIFFITH. That is right.

The telephone industry as a whole in 1938 operated more telephones and supplied more service than it did in 1929, with 101,473 less employees. This does not include employment dislocations in telephone

manufacturing plants or research laboratories within the industry. This is referred to elsewhere.

(Senator O'Mahoney assumed the Chair.)

Representative WILLIAMS. Did you hear Mr. Harrison's testimony?

Mr. GRIFFITH. Yes, sir.

Representative WILLIAMS. Do you agree with him as to the reason for that decline in employment during that period?

Mr. GRIFFITH. I heard Mr. Harrison's testimony and his explanations that the decline was on account of advance planning, and the securing and training of employees in advance in anticipation of business which did not come, and I am in accord with him in that.

Representative WILLIAMS. Also, didn't he make the point, as I understood it, that 1929 was an abnormal year in the construction field, after that there was a letting down, necessarily, of the construction business for the reason that the demand didn't exist, and in other words, as I understood him, they were rather overbuilt and they were in those 10 years following taking up the unutilized facilities of plant.

Mr. GRIFFITH. They didn't foresee that in 1929. I was employed in 1929 by that company and it was considered a normal year until the events that followed showed it to have been a peak year.

Mr. PIKE. That was a fairly characteristic mistake of business, wasn't it?

Mr. GRIFFITH. That is correct.

Mr. PIKE. It wasn't only the telephone company.

Mr. GRIFFITH. That is correct, they were very enthusiastic and planned for the future, evidently feeling that the business for 1930 to 1939 was going to continue right on the way it had during that 10-year period.

Representative WILLIAMS. I got the impression from his testimony, although I may be wrong about it, that that was largely due to an overbuilt condition, and the falling off in employment during that time simply was lack of demand for increased construction improvement, and that it was not due materially to technological improvements in the telephone business.

Mr. GRIFFITH. The point I was trying to bring out is that it wouldn't have been an abnormal time and construction wouldn't have been too high if it hadn't been for the depression; if they could have foreseen the depression I have no doubt that they wouldn't have built up the plant as they did.

Representative WILLIAMS. I am not talking about their failure to get business, but whether or not that was the fact.

Mr. GRIFFITH. They did have too much plant after the depression struck them, that is a fact, decidedly too much.

Representative WILLIAMS. And then do you agree that the falling off of employment following that period was due to that fact, we'll say failure to foresee the depression that was coming?

Mr. GRIFFITH. To a large extent that is correct. The people in the construction department of the telephone companies were a problem, to get them located in other departments to prevent a general lay-off.

Representative WILLIAMS. Well, have you any figures to show while we are on that particular question—then I won't ask anything

more—to what extent the real improvements, technological improvements, have displaced labor?

Mr. GRIFFITH. The chief displacement of labor on which you have available figures, of course, would be the traffic department—operators. I have some figures on operators. Those figures are available, but many of the other displacements in addition to operators are more or less an opinion.

Representative WILLIAMS. Well, have you those figures? If you have, later on I will call for them.

Mr. GRIFFITH. I don't have the figures on construction people, although there were vast numbers of them. We were trying to reassign them in other departments to keep them from being laid off. The principal reason why we adopted the spread-the-work plan was to reassign the construction workers, more than any other one group, because during the 1920's they were a large department, as you doubtless realize.

Take the city of Chicago, for example. In '29, my recollection is they had approximately 1,400 nonsupervisory construction employees. That is my own recollection; I have no supporting data. At the present time, it is my opinion that they have between 400 and 500 in that same department.

Dr. ANDERSON. In the Monthly Labor Review study, to which I referred yesterday, operators as such in your traffic department in 1930 were 54.2 percent of the total labor force employed. Construction workers in central office installations were 5 percent—5.3 to be exact—and line construction workers were 10 percent—or 10.3, to be exact. Cable and conduit construction men were only 3 percent.

According to this tabulation, in 1930 a preponderance of workers were engaged in the traffic department as operators, not in construction.

Mr. GRIFFITH. That is correct.

Dr. ANDERSON. So that the construction workers to be affected are the minor portion of the total employment.

Mr. GRIFFITH. That is correct. When we say "construction," we might not mean exactly the same thing that your committee means by "construction." Construction people generally have to do with the underground facilities or aerial wire, cables, and such as that. That is what we mean by construction.

Another comparison and correlation can be shown by using the telephones-per-employee figure. This may be obtained by dividing the total number of employees for any given year into the total telephones in service. By using such figures secured from Exhibit No. 2581 we obtain the following examples.

Year:	Telephones per employee
1926.....	44.5
1929.....	43.8
1938.....	61.0

The figure 44.5 telephones per employee in 1926 to the 43.8 in 1929 is fairly related, and represents normal growth in those predepression years, when the peak of employment of 387,023 was reached in 1929. The same relation, however does not hold true for 43.8 in 1929 when compared with 61.0 telephones per employee in 1938.

We would like to show for this same period the increase in tele-

phone plant investment and the number of telephones per employee for the corresponding period.

Year	Telephones per employee	Investment telephone plant
1926.....	44.5	\$2,973,932,711
1929.....	43.8	3,862,241,317
Minus efficiency.....	.7	¹ 888,308,606

¹ Increase.

NOTE.—This is only a 3-year period before depression.

Year	Telephones per employee	Investment telephone plant
1929.....	43.8	\$3,862,241,317
1933.....	61.0	4,783,082,079
Plus efficiency.....	17.2	¹ 920,840,762

¹ Increase.

NOTE.—This is a 9-year period including the depression.

It will be noted from these figures that the plant-expansion program was curtailed somewhat for the period after 1929, which would cause some increase in the number of telephones per employee. On the basis of these figures for the 3-year period before 1929, however, it is evident that this accounts for only a very slight part of the marked increase shown for the period following 1929. It is obvious, therefore, that there must be some other reason for the reduced work requirements. We believe that an adequate explanation will be found in the improved methods and equipment employed by the telephone industry. We will introduce further tables to substantiate our contentions.

One general explanation, of course, is that the period of service of the average employee increased considerably during the depression years, when expansion was greatly curtailed, resulting in increased employee efficiency and experience. It is difficult to accurately evaluate the effect of this change, but it has been cited, along with other reasons, and certainly finds support with the telephone employee body.

In a report to the stockholders of the Bell System in 1939, Mr. Walter S. Gifford, president of the American Telephone & Telegraph Co., in outlining factors responsible for employment differences in the 1920's as compared to the 1930's, stated:

A much more experienced and efficient personnel which this difference in the relative proportion of learners [at the end of the boom period in 1929 the number of learners was 90,000 while at the end of 1939 it is only 18,000—1939 annual report of the A. T. & T. Co.] reflects, together with the continuing improvement in methods and apparatus and substantially reduced construction activity, are the major causes of the differences in employment in 1939 in comparison with 1929.

Mr. Gifford's statement would appear to substantiate our analysis of this situation.

Separating the telephone station, financial, and employment situation statistics of the Bell System from the entire industry figures is very revealing. In this connection we direct your attention to the following quotation from A. T. & T., a book by Mr. N. R. Danielian, published in 1939:

By December 1937, the volume of traffic and the number of telephones in service surpassed the peak figure of 1930. Bell-owned telephone stations in service had reached 15,645,000, exceeding the corresponding figure for 1930 by 62,000 stations. The average number of daily telephone conversations in 1937 was over 69,000,000, as compared with little more than 65,000,000 in 1930. The gross revenues of the System reached \$1,069,000,000. The net income of A. T. & T. was at an all-time peak of \$179,831,815, and total dividend payments of \$168,180,906 were the largest in the telephone company's history. But employment did not pick up commensurately. At December 31, 1937, the number of Bell Telephone Co. employees was 272,172, not including Western Electric and Bell Laboratories, which had 47,171 employees at that time. At these levels, there were nearly 92,000 fewer telephone company employees, and about 42,000 fewer people employed by Western Electric and the laboratories together, than in December 1929. In fact, at the very time that telephone traffic was scaling the peak of 1930, employment was back only to 1917 levels.

In brief retrospect, what does "the tragedy of a depression" reveal? Mr. Gifford's organization curtailed the number of workers by 60,000 people in 1930, just at the time Bell System business, in all its phases, was at the peak. After that, through 1933, the various indices of telephone service declined and employment in the Bell Telephone System was reduced by 120,000, or one-third of the total at work four years earlier. Western Electric reduced its force by 66,000 people, or over 80 percent. After 1933, business picked up, so that by the end of 1935, telephone service was only about 10 percent below 1929, but employment was reduced still further, to the lowest levels of the depression period. Since then, telephone business has reached and surpassed the high levels of 1930, but employment in the Bell Telephone Companies still remained, at the end of 1937 25 percent less than in 1929, and Western Electric's labor force was still half of what it was in that year. These conditions cannot be explained by reference to the business slump.

Your attention is directed to this quotation, which brings out the fact that up to the present time considerable dislocation of employment still exists in the plants of the Western Electric Co., which manufactures telephone equipment and is a subsidiary of the Bell System. We are submitting an exhibit which shows the direct labor hours worked in these plants.

(The table referred to was marked "Exhibit No. 2582" and is included in the appendix on p. 17410.)

Mr. HINRICHS. You want that exhibit to be headed "Relative Activity of Western Electric Co.'s Plants," do you not?

Mr. GRIFFITH. Yes.

At this point we introduce "Exhibits Nos. 2583, 2584, 2585, and 2586." These tables were taken from a survey made by the National Research Project of the Works Progress Administration.

(The tables referred to were marked "Exhibits Nos. 2583 to 2586" and are included in the appendix on pp. 17411-17412.)

Mr. GRIFFITH. You will note in "Exhibit No. 2583" that the indexes of output per employee and output per employee-man-hour both increase during the 6-year period from 1932 to 1937.

(Mr. O'Connell assumed the chair.)

Mr. GRIFFITH. "Exhibit No. 2584" shows the progress of dialization of telephone equipment in the Bell System. In 1920 practically all telephones owned by this system were manual, whereas by 1935 almost half of them had been converted to the dial method of operation, and

according to testimony at these hearings it is now around 60 percent, instead of the figures shown for 1935.

We believe that "Exhibits Nos. 2585 and 2586" explain more clearly than we can the consistently increased productivity of the telephone employee. It will be noted, however, that this increase was greater in the case of the operators than for all employees in general.

No attempt will be made here to catalog the many broad and detailed developments in methods and equipment used in the telephone industry, many of which tangible and intangible improvements have been so outstanding that they are generally known. We can state without possibility of contradiction that more and better telephone service is being furnished generally to an ever-increasing number of users, at a lower cost and with the employment of fewer workers per unit of equipment and service.

Determination of the exact character and extent of the technological advances in the industry and their effects on employment past, present, and future will require the cooperation of the telephone industry. A survey of this nature would appear to justify the time and effort required. An additional reason for such a survey is that valuable data might be secured regarding the increased productivity per worker, including the manufacturing branch of the Bell System.

EFFECT OF RATE REDUCTIONS ON VOLUME OF BUSINESS

Dr. ANDERSON. Going back for a moment, you say that this "service is being furnished generally to an ever-increasing number of users, at a lower cost and with the employment of fewer workers per unit of equipment and service."

Do you have any specific figures on changes in rates charged and costs to users of telephones?

Mr. GRIFFITH. I don't have any figures, Doctor, but it is common knowledge among all telephone workers, and also a worry, I might add, that the ever-increasing demand for lower rates might in time affect the welfare of the workers. That is one of the major problems that they keep watching.

Dr. ANDERSON. The demand for lower rates has been met by actually lowering rates the country over?

Mr. GRIFFITH. They have, particularly in the long-distance field, but there have been also other rate reductions that affect certain subscribers, such as suburban areas adjoining large metropolitan centers, and so forth.

Dr. ANDERSON. In view of the data you submitted elsewhere and discussed previously with respect to the net earnings of the telephone corporation, do you care to hazard a judgment as to whether or not rates now charged are as low as they could reasonably be?

Mr. GRIFFITH. Well, you are touching on a delicate point there, Doctor. That would depend on the amount of business that the companies could secure. If the amount of business they could secure would justify a decrease it would be satisfactory; but how would you know, if you instituted a Nation-wide rate cut of drastic proportions, that they would come out with a profit, at least for a long time in the future?

Dr. ANDERSON. I assumed that there was some discussion, current discussion, about lowering prices and thereby increasing volume and increasing employment. Do you have any judgment on that?

Mr. GRIFFITH. It is our impression, of course, that the cheaper you make a product and the better the product is, the more business you would thereby secure.

Dr. ANDERSON. But large profits of telephone companies do not indicate to you that prices of telephone service could reasonably be lowered to increase that business?

Mr. GRIFFITH. The public in general, in my opinion, is not clamoring for any great reduction. That is usually the political bodies.

Mr. HINRICHS. Mr. Griffith, in connection with the question of studies of employment and output, is it your feeling that studies of that sort should be continuously made by some agency of the Federal Government?

Mr. GRIFFITH. I would think that the manufacturing ends of the industry should be included in any studies made by the agencies of the Government. I think you will find that even more interesting and revealing than the statistics you have secured on the operating companies.

Mr. HINRICHS. Well, would you limit studies of the relationship between output and employment to the manufacturing end? In general our interest in the Bureau of Labor Statistics is in all workers and not necessarily confined to manufacturing workers.

Mr. GRIFFITH. All workers, of course, but it is just my impression that you have more statistics available on the other branches of industry than you have on manufacturing. There have been more studies made in the past—at least there have been more called to our attention.

Mr. HINRICHS. Those studies, if they are going to be significant to you, need to be kept up to date. It is not just a question of a study one time and then putting it away on shelves to gather dust, is it?

Mr. GRIFFITH. That is correct.

Mr. HINRICHS. These changes are going on, sometimes large and sometimes small, but changes are going on every year.

Mr. GRIFFITH. That is correct.

Mr. HINRICHS. And therefore studies of that sort, if they are going to be really significant in serving the purposes of management and labor in discussions of technological change, need to be continuously made.

Mr. GRIFFITH. But as a labor union we represent the people in the factories as well as the industry. Looking at this thing sanely, the cheaper the telephone companies can buy their material from the Western Electric Co., naturally the cheaper they can install it and the less increase will there be in their investment. On the other hand, a large part of every dollar they spend with every factory goes to wages, so as a labor union we are keeping that phase under close attention.

(Senator O'Mahoney assumed the chair.)

Mr. GRIFFITH. The Western Electric section of the telephone industry is competitive, regardless of what you might have heard to the contrary. I worked out there for a number of years, and I know it is highly competitive with other companies in the electrical field. Studies and comparisons are made at all times, and of course if

there is too much for cheapening their product, that would reflect itself in the opportunities for our people who are now employed, or have been employed in the manufacturing end of this industry. Too many people forget one phase of any situation while they are concentrating on another.

Mr. O'CONNELL. What do you mean by saying that the Western Electric is competitive? Do you mean it is competitive in securing the business of the A. T. & T.

Mr. GRIFFITH. There are many other companies manufacturing telephone equipment in addition to the Western Electric Co., and the prices that the Western Electric charge must compare with the prices charged by other companies. I myself took part in securing data which were finally used in a rate case to prove that the products manufactured by Western Electric could not be manufactured any more cheaply by any other manufacturing concern, in similar quality and of similarly close limits and methods of manufacture.

Mr. O'CONNELL. I don't think I made my question entirely clear. Does Western Electric supply the A. T. & T. system with these telephones?

Mr. GRIFFITH. They supply much of it. The Automatic Electric Co. of Chicago also furnishes much of it, particularly the dial equipment that is used in the smaller areas. That is secured from the Automatic Electric Co. of Chicago, and not manufactured by the Western Electric Co.

Mr. O'CONNELL. Do they manufacture that type of equipment?

Mr. GRIFFITH. During the times when the Automatic Electric Co. was unable to provide enough, the Western Electric Co. also went into the manufacture of this equipment. They set up a department in Hawthorne, in Chicago, for that purpose. That department has now been done away with.

Dr. ANDERSON. What was the reason for doing away with the department if they were successful as a subsidiary of the corporation in supplying it with that equipment at one period of time? Why did they cease doing it later?

Mr. GRIFFITH. That brings up a point where many people are not exactly in accord with the policies followed by the Bell System. They use the Automatic Electric Co. as their main source of supply, and only use the Western Electric Co. for the excess over and beyond what the Automatic Electric Co. can furnish. When the demand slackened off they discontinued manufacturing their own products.

Dr. ANDERSON. I should like to ask why, if most of the electrical equipment used by the Bell System is manufactured by its own subsidiary, and I presume at a profit, as you have indicated the profit structure of the subsidiary, they discontinued such profitable business within their own subsidiary and farmed it out, paying the profit to a competing firm?

Mr. GRIFFITH. It has been my impression all the years I have been with the firm that they want these other companies to remain in business.

Dr. ANDERSON. I understood this was a business structure for profit. What is the basis of the want? Why do they want it to remain in business?

Mr. GRIFFITH. It is our impression, and just my own personal opinion in the matter, that they do not wish to be regarded as strictly monopolistic in all phases of their work.

Dr. ANDERSON. You mean, wish to be regarded as monopolistic in the public eye?

Mr. GRIFFITH. That is correct. They buy material from many, many suppliers.

Dr. ANDERSON. And in order to satisfy that wish, is it considered profitable in this business structure to pay profits out of company funds to other competing firms?

Mr. GRIFFITH. I couldn't tell you, of course, as to the financial arrangements they have with the Automatic Electric Co. It may be that they are under contract so that they have to give them a certain amount of business. That is strictly a hazarded guess, you might say. I don't know. With their own company, the Western Electric Co., they may break contracts at will.

Mr. PIKE. The patent group involving the dial telephones certainly involved the Automatic Electric Co., which, if my memory is correct, controlled some of those patents.

Mr. GRIFFITH. I believe you are correct, and it would seem, offhand, that it would be natural to assume that they did have negotiations and enter into some sort of agreement which they probably had to live up to all through the depression.

Mr. PIKE. Normally it was a result of contractual relationship with the selling company that it would get the first crack at the selling of those things.

Mr. GRIFFITH. I don't know; I am not a member of the management of the corporation, and I do not know what they have done in management contracts with other corporations. I just know, as an observer and representative of all our people, what happens, and that particular angle is not regarded with high favor by our members. We would prefer that the Western Electric Co. get the business and then that the excess go to outside companies, but that is just the reverse of what they did.

We are not aware of any comprehensive studies being conducted at the present time, although it is our opinion that research departments of several universities have at various times investigated working conditions in the Bell System. The results of one such study made at the Hawthorne plant of the Western Electric Co., have been published by the Harvard University Press, under the title "Management and the Worker"; F. J. Roethlisberger and W. J. Dickson are co-authors.

EFFECT OF MECHANIZATION

Another study that has come to our attention showing results of the change from manual to dial operation in the telephone industry was conducted by the Women's Bureau of the United States Department of Labor, Bulletin 110, printed in 1933, covering a period in 1930 and 1931.

This study indicates that the industry attempts to cushion these dial conversions by giving only temporary or occasional work to operators before these cut-overs. However, on page 6 of the above study, the

following disposition of the 534 operators on the pay roll just before the cut-over was as follows:

	Regular employees	Temporary and occasional
Total before cut-over.....	312	222
Retained.....	253	7
Transferred.....	37	94
Resigned.....	18	9
Laid off.....	4	112

This study was conducted in a manufacturing community with a population of nearly 200,000.

Mr. HINRICHS. What is the distinction between regular and the temporary workers as you used the terms here?

Mr. GRIFFITH. A temporary employee in the traffic department is one who is specifically hired for a certain period. They tell her when they employ her that her period of employment is to a certain date—June 6, 1942, or some particular date, after which it is uncertain. So when she takes that job she understands thoroughly that it is a temporary job. However, if they do have need, and they usually do, of at least a few of those temporary girls, they take the best of them—naturally they would—and assign them permanently, after which they are subject to the rules and regulations of a permanent employee and not a temporary employee.

Mr. HINRICHS. For how long a period are temporary appointments made?

Mr. GRIFFITH. Up to 2 years or so.

Mr. O'CONNELL. According to these figures, about 40 percent of the total working force before the cut-over were classified as temporary and occasional.

Mr. GRIFFITH. When they decide when a certain area is to be converted—of course the factors involved in their decision are the changes in the neighborhood, degree of obsolescence of equipment, and all that sort of thing—beginning then all the girls that they hire are hired on this temporary basis.

Dr. ANDERSON. Well, speaking to that point, you undoubtedly heard the testimony given by Miss Rose Sullivan yesterday afternoon—

Mr. GRIFFITH (interposing). Yes.

Dr. ANDERSON. And to refresh your memory with respect to the particular study you are now reviewing, I will read you a portion of it:

All the employees for about 3 years before the cut-over were hired on a temporary basis, and so were automatically out when no longer needed.

Does your knowledge of this particular study come to the same conclusion as the table you have inserted in the record, that temporary employees were hired for about 3 years prior to the cut-over?

Mr. GRIFFITH. Well, perhaps it would be 3 years in some cases. I said 2 years; 2 or 3 years. They are hired, however, with that understanding that they are temporary employees. There is no doubt about that whatsoever.

Mr. HINRICHS. Now, is that practice of hiring temporary employees used after the station has been converted? Is it usual today in a dial station to hire workers on a temporary basis?

Mr. GRIFFITH. Oh, no; a temporary basis is concluded when the area is converted, when the conversion is complete, on a certain specific date. We know that as long as 18 months or 2 years in advance. I worked on dial conversion projects myself. The exact day and hour of the conversion is known 18 months or 2 years in advance.

Mr. HINRICHs. So that the temporary hiring is, as far as you know, used only in connection with the conversion of stations?

Mr. GRIFFITH. That is correct, and I am quite positive that they have not deviated from that. If they had, it would have been called to my attention by our operator union employees.

Dr. ANDERSON. So as to have it very clear in the record, it is not a general policy of the A. T. & T. Co., to hire new employees on a temporary basis?

Mr. GRIFFITH. Only when there is a conversion in the picture. That is the only time.

Dr. ANDERSON. Otherwise all new employees are hired as regular employees.

Mr. GRIFFITH. That is right, subject to the regulations going with regular employment. I might add that this method is meeting with favor among our operators. They prefer that the steady older employee who desires to remain in that employment as long as she is of working age, do so; they prefer that any changes in employment be among these newer people who have been hired on a temporary basis. Many of these people hired on a temporary basis are former employees who have gotten married and for one reason or another want a job, the husband is out of work, or ill, and they desire temporary or part-time work; often they wouldn't accept steady employment. What they want in many cases is temporary work only.

Mr. HINRICHs. But it isn't your contention that the system of hiring temporaries is undesirable; you are merely introducing the picture in order to show the change in total employment; isn't that right?

Mr. GRIFFITH. That is right; I am just trying to tell you what is done and what our people think about it.

Mr. HINRICHs. From the point of view of the individual or individuals, some of whom in any event are going to be laid off, it is better to have an advance notice of that fact than to go in ignorance of it until the last minute.

Mr. GRIFFITH. That is right. Our telephone people are not experts in economics and all that sort of thing; they think it is fine they can secure part-time employment, and those regularly employed think it is equally fine that if there is due to be a decrease in the force it should be handled in that way. We don't say that it is the right over-all economic picture. We are not talking about that. Our people don't know anything about economics except as it affects themselves.

POLICIES OF UNIONS IN A. T. & T.

Dr. ANDERSON. With respect to the negotiations that you and your unions carry on, do you make a distinction between regular and temporary employees?

Mr. GRIFFITH. Regular and occasional employees?

Dr. ANDERSON. Temporary and occasional.

Mr. GRIFFITH. Absolutely.

Dr. ANDERSON. In other words, you carry two types of employees in your record.

Mr. GRIFFITH. Yes, sir.

Dr. ANDERSON. Are other distinctions made in union practices with respect to these two groups? In negotiating, what do you do? Do you lump them all together as a single group or carry them as distinct groups?

Mr. GRIFFITH. In negotiating for wage increases they are treated as regular employees. For example, if they have 2 years' service with the company, they receive progression schedules that go with that employment. They would get perhaps 3 increases during that period, the same as if they were scheduled to become regular employees.

Dr. ANDERSON. As regular employees in your negotiations, do they then begin to regard their temporary status as something that no longer holds, and do they make demands upon the union to see to it that they are carried on the employment rolls?

Mr. GRIFFITH. Those who are hired for a definite period have no comeback if they are not retained, and we have received no general complaints. If they are retained, however, we insist that they be treated as regular employees.

Dr. ANDERSON. You mean they are given a terminal date for employment when they are hired?

Mr. GRIFFITH. Oh, yes, yes.

Dr. ANDERSON. When they are hired an indication is made that within 3 years they will be severed, for instance, from employment?

Mr. GRIFFITH. At least in some cases the employer mentions a certain date, the day of the month.

Dr. ANDERSON. In all cases?

Mr. GRIFFITH. I can't say what they do all over the United States, of course, but I don't believe there has been very much deviation from that, at least in serious proportions, or it probably would have been called to our attention.

Mr. PIKE. When they are transferred from temporary status to permanent status, you see that they get their seniority back?

Mr. GRIFFITH. They get it. That has all been taken care of a long time ago, and it is carried right on through automatically.

Mr. PIKE. This isn't like a company I watched work for a while that gave a 50-year medal to an employee, and found he was still carried on the rolls as a temporary mill clerk?

Mr. GRIFFITH. Things like that do occur even in the best-regulated families. I recall that we had a janitress in Chicago—at that time I represented those people also—and this lady became sick for the first time in her 15 years of employment with the company. When she failed to receive her check for sick benefits we looked into it and found she was carried as a temporary employee.

Mr. PIKE. That was just an oversight.

Mr. GRIFFITH. That is right; and their faces were rather red. It was taken care of very speedily, as soon as we called it to their attention.

Mr. MAGINNIS. Mr. Griffith, is your union an A. F. of L. or a C. I. O. union?

Mr. GRIFFITH. It is neither. I might add that we insist on independent status and we are patterning our organizations after the well-known railroad brotherhoods, attempting to function as they have functioned so well.

Mr. MAGINNIS. How long has your union been in existence?

Mr. GRIFFITH. Our national federation, as a federation, has been in existence since June 1939. Of course, many of the component parts of it have been in existence for longer periods.

Dr. ANDERSON. Mr. Griffith, on that point, you may want to comment on the rumor or statement which many of us have heard to the effect that your federation amounts to a federation of company unions of the Bell System.

Mr. GRIFFITH. I have heard that a few times, you might imagine, myself, and I know exactly the feelings of your committee in that regard. Some of our organizations were company unions. They have been entirely reorganized and the other organizations done away with completely. Our present organizations live up to all provisions of the regulations, cross every "t" and dot every "i."

I will challenge any other labor organization to show halfway as clean a record as ours since 1935. To understand the labor situation in the telephone industry, you have to know something about the industry, you have to know something about the people in the industry. Other organizations have done wonderful work in their lines of work. They have no understanding of the people in the telephone industry or other utilities where there is a service element attached to it, that spirit of service. It might be amazing to this committee to know that in the old days before service was at the present high standard, if there was a storm during the night the telephone man would get up and go to work and get there at 3 or 4 o'clock in the morning. Nobody called him, nobody asked him to do that; he didn't get any extra pay for it. After the practice of overtime payment was instituted, the company had difficulty getting some of the men to accept. They figured it was just part of the job to do the work. It is an astonishing thing; you people should have an understanding of that. If any of you have ever been a salesman you know that you cannot use the same selling methods to all people. If you go to sell a life-insurance policy to a teamster you don't use the same tactics that you do to sell to a college professor. The same way with our people, that is why our federation is successful. We know our people. Other organizations have been unsuccessful insofar as the telephone industry is concerned. It is my opinion that our organization will continue to increase in prestige and effectiveness, as we have already done to a certain extent. In the future it will increase and we will be able to work side by side with these other labor organizations for the common good of all people at work. That is our aim. Some unions already work with us in that light in some locations in some parts of the country, and others do not. It hurts our pride a little bit, of course, to have people refer to us as company unions all the time, and to hear witnesses in these hearings state that our industry is not organized, but take it from me, it is. We have got the members; they haven't.

I hate to chide the committee in any way, it is presumptuous, of course, but it is noteworthy that nobody asked the other witness how many members they had in the industry.

Mr. PIKE. How many have they?

Mr. GRIFFITH. If you can get them to tell you, you will be very good. It is my guess that it is something less than 3,000.

Mr. PIKE. You have 115,000?

Mr. GRIFFITH. We have 110,000.

Mr. O'CONNELL. How many people are there in the industry?

Mr. GRIFFITH. Organized into independent unions at the present time, we estimate there are 225,000. We have another 100,000 yet to go.

Mr. O'CONNELL. Do you mean all workers in the industry?

Mr. GRIFFITH. That is right; nonsupervisory. That is another distinction we draw that other labor organizations do not; we want only the people that work, not the supervisors, foremen, general foremen, chief operators, and what not that the other organizations want. We believe that a labor organization cannot function properly if the members of the management are a part of that organization. We insist, therefore, that they not be members of any one of our member organizations.

Mr. O'CONNELL. Does your union operate under what is known generally as the industrial basis?

Mr. GRIFFITH. Industrial. We represent everybody in all departments, all branches of the industry, and our member organizations likewise.

EMPLOYEE POLICIES IN THE BELL SYSTEM

Mr. GRIFFITH. Practically no unskilled labor is utilized by the telephone industry. Many of the phases of telephone work are highly specialized, with no comparable work being performed elsewhere in industry. It is common knowledge among telephone people that unemployed telephone workers, particularly male employees, usually find it necessary to begin anew in a different and often semiskilled line of work at a sharply reduced income.

The A. T. & T. and associated companies have made some use of the separation allowance to reduce the adverse effect of lay-off on the displaced employee. It is not believed that any standard practice has been agreed upon in this regard. In general, however, the worker dismissed due to lack of work is given his regular vacation allowance plus 1 week's wages for each year of service up to 10 years, and 2 weeks' wages for each year of service in excess of 10 years.

In the operating companies the separation allowance is, at times, offered to operators on a voluntary basis as an incentive to resignation. In contrast to this, however, the Western Electric manufacturing and installation branches have in the past used the separation allowance as a means of keeping a supply of skilled workers available in case an increase in business justified their reemployment.

In Mr. Gifford's 1939 report to the stockholders, he states that the Western Electric Co. has made an initial appropriation of \$1,045,000 for an employment stabilization reserve, which the company hopes will become a real help in dealing with its employment conditions, which are fundamentally less stable than those of telephone operating companies. The method of utilizing this fund is not known.

This review of the effect of technological advance on employment in the telephone industry would be incomplete if we failed to mention the feeling on the part of the great majority of the rank and file of the telephone workers, especially of the Bell System employees, a majority of whom we represent, that they are not receiving an equitable share of the profits from the business. We direct your attention to the loss of many thousands of telephone jobs during the last depression without reduction of the \$9 dividend paid to the stockholder by the A. T. & T. Co.

As an immediate and temporary expedient in order to spread employment, we advocate the adoption of a shorter workday and work-week without reduction in wages paid for the telephone industry.

Employment conditions in the Bell System, which include vacations with pay up to 3 weeks for 15 years of service, a sickness benefit and pension plan, generally safe and pleasant working conditions, vocational general training programs, pay-roll deduction to provide for payment of life insurance, hospitalization premiums, and purchase of U. S. savings bonds, are highly regarded by the workers.

The average telephone worker, while affiliating, or retaining his independent right to affiliate, with a union of his own choosing, nevertheless exhibits a well-known and profound interest in rendering service of the highest type to the public at all times.

For many years in practically every section of the Nation, telephone workers have been welding themselves by democratic process into independent labor organizations of ever-increasing strength and effectiveness. This movement was greatly accelerated by the passage of the National Labor Relations Act by Congress on June 19, 1934, and the subsequent amendment of this law on July 5, 1935, to bar assistance of any kind by an employer to a labor organization of his employees. It is estimated that today there is a total of 225,000 members of independent labor unions in the Bell System alone.

As the organized telephone worker began to appraise his situation he became aware of the existence of problems—national problems—which transcended State lines and eluded any attempt at solution by his individual organization. In addition, there developed an appreciation and desire for the inspiration and guidance that is to be gained from a close contact with the many thousands of other telephone people throughout the country.

On June 5, 1939, the National Federation of Telephone Workers, with a membership of approximately 110,000 of Bell System workers, was organized at New York City.

Virtually all of the National Federation of Telephone Workers affiliates have collective bargaining contracts with the operating companies by whom their members are employed. The membership of the National Federation is not confined to Bell System workers. A copy of the official proceedings of the constitutional convention and fourth national assembly of National Federation of Telephone Workers held in New York City, June 5-9, 1939, has been turned over to the counsel of your committee. From this may be obtained a general knowledge of the aims and objectives of the organization and its constitutional structure.

The National Federation of Telephone Workers is the only labor organization, national in scope, which represents any appreciable

number of Bell System workers, and is either authorized or qualified to speak for them.

Incidentally, Mr. Chairman, every telephone man in your great State is a member of our organization.

The CHAIRMAN. We have got a lot of fine telephone men out there.

Mr. GRIFFITH. That is right. Do you think the cowboys you know out there could be coerced in any way by the management or anybody else?

The CHAIRMAN. I doubt it.

Mr. GRIFFITH. The Senator says he doubts it. We would like to have you, along with Senator King and Senator Thomas, attend part of our meeting at Salt Lake City in June if it is convenient to you, Senator.

The CHAIRMAN. Well, I appreciate the invitation. We may not be out there by then.

Mr. GRIFFITH. We believe we have furnished you with the main outlines of the problems associated with technological advances and employment in the principal section of the telephone industry. It is our hope that in so doing we have been of service to the committee.

That concludes my regular report, and I have a few remarks that, if it is agreeable with the committee, I would like to add.

Mr. CHANTLAND. May I ask a question before you go to your general remarks? You say there are 225,000 members of independent labor unions in the Bell System, and that your federation represents 110,000.

Mr. GRIFFITH. That is correct.

Mr. CHANTLAND. And it is the only one of size. What is the situation as to the other 115,000?

Mr. GRIFFITH. The others belong to independent organizations now, similar in their organization to those that comprise our National.

Mr. CHANTLAND. You mean they are what might be called locals?

Mr. GRIFFITH. That is right, organizations in their own territory. Incidentally, we have only been officially organized since last June, and from that period to now we feel we have done quite well to get 110,000. We think we will have that other 115,000 shortly.

Mr. CHANTLAND. Are any of the 115,000 outside your Federation, besides the ones that Miss Sullivan represented, so far as you know affiliated with the two older, larger labor organizations?

Mr. GRIFFITH. They are.

Mr. CHANTLAND. How many in number?

Mr. GRIFFITH. Those A. F. of L. contracts are of long, long standing, nothing recent. In the city of Chicago we have 400 installers who install equipment in Cook County. That contract has been in effect since 1910—400 American Federation of Labor installers. They are employees of the Illinois Bell Telephone Co., the same as anyone else, and subject to all benefits, but they carry cards in the American Federation of Labor.

Mr. CHANTLAND. Can you give a judgment of the total number of people out of this 115,000 that are so affiliated?

Mr. GRIFFITH. Four hundred in the city of Chicago and the plant workers in the State of Montana. I am sorry I can't tell you how many plant workers there are in the State of Montana, but that is a rather sparsely populated State and there wouldn't be so very many.

That also is a condition of long, long standing. Our people work with these people in complete harmony.

Mr. CHANTLAND. You left out the number Miss Sullivan had.

Mr. GRIFFITH. You are right. In addition to the 400 installers in Chicago and the plant men in the State of Montana, the American Federation will have some members in some exchanges in the New England territory. There are two organizations in that territory—the Telephone Operators' Federation and this American Federation of Labor affiliate that Miss Sullivan represents.

Mr. CHANTLAND. From what you say, then, would it be correct to say that less than 5,000 all told are thus affiliated?

Mr. GRIFFITH. It is my impression that 5,000 would be quite a safe figure on the high side.

Mr. CHANTLAND. Thank you.

Mr. O'CONNELL. You say 225,000 workers. Do you mean that is the total of the workers in the industry, or the number of workers in the industry who are affiliated with some labor organization?

Mr. GRIFFITH. That is correct, affiliated with some labor organization.

Mr. O'CONNELL. How many workers are there in the industry, organized or unorganized?

Mr. GRIFFITH. There must be pretty close to 300,000 in the Bell System who are not supervisors, 275,000 or 280,000 anyway. It is very difficult, of course, to pick out just exactly how many.

Mr. O'CONNELL. When you speak of the industry you mean a broader classification than the A. T. & T. system?

Mr. GRIFFITH. That is correct, because there are numerous independent companies, some of which are of quite large size.

Mr. O'CONNELL. There are no more than 300,000 workers in the total industry?

Mr. GRIFFITH. Counting the independent workers, it would run decidedly more than 300,000.

Mr. PIKE. There are about 4,000,000 non-Bell telephone stations?

Mr. GRIFFITH. That is correct. Almost 17,000,000 are operated by the telephone company, and the balance, up to almost 21,000,000 are operated by the independent systems.

Mr. O'CONNELL. What I was trying to get at was the extent to which the industry is organized one way or another.

Mr. GRIFFITH. The figures are very fragmentary with regard to the independent employees because there is such a vast number of companies and some of them are more or less on a part-time basis. Some of the central-office exchanges of the small independent concerns might be in the bedroom of a man's residence. His wife might be the operator, and this man might be a farmer, for example, who would do the repair work on Sunday afternoon or in the evenings. It is very difficult to secure figures on all that, and, needless to say, when there is a two-man telephone company like that they do not belong to any labor organization of any character whatsoever. They own the company, or most of them do.

There are, of course, a number of larger independent companies with thousands of employees and lots of companies of varying size in between, and it is my impression that the A. F. of L. has had some of the operators in some of those companies. I heard of one such

company where they had 20 operators that belonged to the A. F. of L. Those figures are fragmentary and concise, exact figures put out by the statistics department of the A. F. of L. have never been called to my attention.

SEPARATION PAY

Dr. ANDERSON. Mr. Griffith, may I refer again to the separation allowance which you discussed, because it has been a point of controversy in these hearings with Mr. Harrison's statement of the morning and a contradictory statement in the afternoon by Miss Sullivan. You have taken a somewhat in-between position when you say the A. T. & T. associated companies have made some use of the separation allowance. When effecting or negotiating a contract with the A. T. & T. is that one of the specific points in your contract?

Mr. GRIFFITH. No, sir; we have never been able to pin them down to any guaranty as to separation allowance.

Dr. ANDERSON. Do you have a copy of the kind of contract that you attempt to get with the A. T. & T. with you?

Mr. GRIFFITH. I do not. I didn't bring any contracts.

Dr. ANDERSON. Would it be possible to supply the committee with negotiation contracts? Are they public documents?

Mr. GRIFFITH. I could probably secure them for you. I don't have them here. I can have them sent to our Washington representative and he in turn would give them to you.

Dr. ANDERSON. When you said they have made some use of the separation allowance, you have no specific figures as to the proportion of workers covered by a separation allowance?

Mr. GRIFFITH. That is correct. In general I think they use it even in the case of very small lay-offs or perhaps a discharge for cause. I have even heard of their giving a separation allowance of a few weeks' pay, plus a vacation, if they are eligible for any vacation in the service that they have. I have heard no complaint in that regard. They are liberal in their interpretation as to the vacation allowances to which a discharged person is entitled.

Dr. ANDERSON. You also discussed briefly the Western Electric Co. employment stabilization reserve fund of a million dollars. Is that only in the Western Electric Co.?

Mr. GRIFFITH. That is correct; only in the Western Electric Co. That is where the worst shock of the depression was felt by the employees of the Bell System. It was a very, very disheartening spectacle to walk through the great Hawthorne manufacturing plant of late years and recall how it was when I was employed there myself.

Dr. ANDERSON. You go on to say that the method of utilizing this fund is not known.

Mr. GRIFFITH. That is correct.

Dr. ANDERSON. Have you sought to find out the specific method that the company uses in applying the fund?

Mr. GRIFFITH. No; we have not. We did not know of its existence until we saw it in the bulletins issued by the system.

Dr. ANDERSON. You had no part in the negotiation of such a fund?

Mr. GRIFFITH. None whatsoever. Of course, there has been a lot of discussion in regard to the general phases of this unemployment condition throughout, and it is just a recognition on the part of the

company that they are taking some steps to quiet this feeling of unrest.

Dr. ANDERSON. But there is no such fund to cover A. T. & T. operators?

Mr. GRIFFITH. That is correct. Any separation allowance that is given by the operating company, so far as I know, they merely take out of their own funds. How they account for it in the bookkeeping end I couldn't say.

Mr. HINRICHS. Pardon me; Mr. Anderson used two phrases—one the terms that you had tried to secure or wished to secure in contracts and the other the copies of contracts now in existence. Are those two synonymous, or would you wish to distinguish between the contracts that you are going to submit and the terms that you would like to see?

Mr. GRIFFITH. The features that we hope to secure in some of our contracts we do not now have. After all, the contracts that we do have, the agreements that we do have, are something that some other organizations were unable to get in many, many more years than we have had months.

Mr. HINRICHS. Is it your feeling, Mr. Griffith, that this problem of technological displacement is one which should primarily be handled by negotiations between a union representing the workers and the employers in the industry, or is it a field in which legislation is needed?

Mr. GRIFFITH. Our people are very independent in their thinking, and they would not ask for aid from the legislative bodies unless they felt that bargaining was breaking down. It may be the answer in the ultimate. As I say, our people are not economic experts. They don't look at these things the way you people do, of course. They are looking at how these things and these changes affect them. I might add they do not take the view that of course this committee would, that each industry has a certain duty to keep a certain number of people employed. Our people by and large do not go for that view. We take the viewpoint—when I say “we” I mean all our people—that as the stagecoach departed and as the pony express departed, and a lot of things like that, our industry will likewise change, and we as employees can't keep it from doing that. However, as representatives of these people we feel that they should be given important consideration in bringing these changes into effect. That is our view. We are not fighting the change, if such a change is beneficial to the public. Our company maintains that they have three factors to consider: the public, the owner, the employee. We would just change that around a little bit: The public, the employee and the owner.

That is the view of our people in regard to the consideration that is given. It has been brought out many times here in previous testimony, and the companies have put it out in their publicity. Mr. Harrison himself here repeated also that a higher degree of skill now is needed on the part of the telephone workers—that the need for skill is ever increasing. Well, if you tell our people that, they naturally are going to believe it, and want wages and salary commensurate with that increase in skill. That is what we are going to have.

Dr. ANDERSON. Mr. Griffith, as the federation representative, do you seek at some future date to negotiate on a national basis with a single entity called the A. T. & T.?

Mr. GRIFFITH. We expect in the future to deal with the American Telephone & Telegraph Co. and also the heads of independent companies on two bases, we might say: first, we see no reason why we couldn't act as an appeal agent to them or to a subsidiary company head in the event one of our member organizations feels that they are not getting anywhere with their local people. That would be the first basis that we would seek to contact the A. T. & T. Co. on, and the second would be on general problems, on which the master minding comes from the American Telephone & Telegraph Co. in the first place. In fact if we wanted to negotiate for changes in the pension or benefit plans, as all the companies have the same plans, the representatives of all the subsidiary companies would have to agree to any change. Those changes, and a lot of other changes, are coordinated, I will say that, at least, coordinated at 195 Broadway, the headquarters of the American Telephone & Telegraph Co. Obviously, we would save a lot of time if we dealt there in the first place, and that is what we plan to do.

The CHAIRMAN. That is what you plan to do?

Mr. GRIFFITH. Yes, sir.

The CHAIRMAN. I suppose the fact that the telephone company has one central office for the entire country is one of the reasons why you deem it necessary to have one central office for all of the workers in your union?

Mr. GRIFFITH. That is correct, Senator. We think that the A. T. & T. Co. seems to have been a fairly successful corporation, and if it is profitable to them and of benefit to the public to coordinate their affairs in one central location, by a similar line of reasoning we should also do the same thing.

The CHAIRMAN. In other words, the telephone business is evidently a national business?

Mr. GRIFFITH. That is correct.

The CHAIRMAN. Operated from a national headquarters?

Mr. GRIFFITH. That is, the major portion of it is.

The CHAIRMAN. The final authority rests in the national headquarters, doesn't it?

Mr. GRIFFITH. They own the business, and naturally they have the final authority, no matter how they soft-pedal it.

The CHAIRMAN. There are regions all through the United States and subsidiary companies, are there not?

Mr. GRIFFITH. Yes, sir.

The CHAIRMAN. Those regions and subsidiary companies are established without regard to the geographical boundaries of States, are they not?

Mr. GRIFFITH. Many of the companies do follow State boundaries. The Illinois Bell Telephone Co. follows the boundaries.

The CHAIRMAN. Many of them do; they don't all.

Mr. GRIFFITH. They often follow natural boundaries, such as a river. In your neighborhood, the boundary between the Pacific Co. and Mountain States Co. follows the Snake River up there in Idaho.

The CHAIRMAN. That is a mighty fine river to travel on, too. I will put in a plug for the summer attractiveness.

Mr. GRIFFITH. That is great country out there, Senator; I agree with you.

The CHAIRMAN. And then, of course, there is the North Platte River in Wyoming, of which it is said that it is a mile wide and an inch deep, and flows uphill.

Mr. GRIFFITH. Sometimes it is different, though. In 1921 I saw it a little different than that.

The CHAIRMAN. Seriously speaking, these regions of operation are not identified with the States?

Mr. GRIFFITH. They are not.

The CHAIRMAN. As a rule. And I suppose that in your operation you pay very little attention to State lines?

Mr. GRIFFITH. That is correct. We follow whatever method appears to be the most efficient and the best. We may change them from time to time.

The CHAIRMAN. So here you have a big national business upon the one hand, and a big national union upon the other?

Mr. GRIFFITH. That is correct.

Mr. MAGINNIS. May I ask, Mr. Griffith, your impression of Dr. Anderson's question along the line as to whether your federation doesn't look forward, perhaps in the not very distant future, to the time when the A. T. & T. will have taken in all of the independents?

Mr. GRIFFITH. Well, it doesn't look to me as though they are going to take in all the independents.

Mr. MAGINNIS. You don't think that is inevitable?

Mr. GRIFFITH. I gather that the Federal Communications Commission—it is also my impression from statements issued by President Roosevelt that he would be more or less in favor of that, but here is the hitch to that. I can tell you as an engineer. It would cost an awful lot of money because much of the equipment that the independent companies have is not Bell standard by any manner of means, and it would certainly be a huge undertaking to bring all the telephone service of the United States up to Bell standards.

Dr. ANDERSON. But, Mr. Griffith, referring to your table on the number of carriers,¹ there has been a constant trend of mergers, as you indicated in your testimony, so that in 1928 we had 140 different companies operating, and in 1938, only 73.

Mr. GRIFFITH. That is correct. It is my impression, however—it might be interesting to check into it further—that the General Telephone Corporation and others are themselves getting larger. It is my recollection that there are 6 major telephone systems in this country, out of the six-thousand-odd companies, in addition to the Bell Telephone Co.; a total of 7 that are of any size at all.

UNION ATTITUDE TOWARD MECHANIZATION

Dr. ANDERSON. You didn't mention specifically whether your union would oppose the cut-over from manual to dial telephones, as Miss Sullivan indicated yesterday that her organization did.

Mr. GRIFFITH. I could comment on that, doctor, from two viewpoints: first, the unions; and second, my own private opinion as an engineer, and a man who has worked in dial equipment the major part of my term of employment. Regardless of our other views, I will

¹ See "Exhibit No. 2379," appendix, p. 17408.

agree with Miss Sullivan to the extent that the dial system is inevitable. Independent companies installed dial equipment a long time before the Bell System did.

Some of the types of dial equipment that they used were a rather queer looking piece of apparatus, obviously entirely unsuited to any except very small neighborhoods, and it seems, therefore, that the Bell System didn't choose to begin dial until they had some equipment that would be usable and proper anywhere. I saw one installation of dial equipment in a small town in Indiana one time where every single solitary number that could be reached was on the dial. The only way they could get more telephones would be to have a bigger dial, and you had to use a needle to do your dialing. That equipment was installed and in use 35 or 40 years ago.

It seems to me it would have been foolish for the Bell System to go to dial on such a proposition as that. Our people, as I said before, are resigned to the inevitable so far as dial is concerned, and they are concerned that the change shall be on a very gradual basis in order that employment may not be disturbed and that the change-over will not have any detrimental effect on them as a whole. After all, there are a lot of people retiring every year, and people die every year.

The CHAIRMAN. There isn't any dispute about the central fact in all this testimony; namely, that by reason of the technological advance, the telephone company can and does give greater and better service with fewer employees.

Mr. GRIFFITH. That is absolutely correct.

The CHAIRMAN. It is also true that you and Miss Sullivan, speaking for the unions, declare that you do not wish to be understood as opposing technological advances, though Miss Sullivan believes that the dial system does not have values of sufficient degree to justify its full use. Now, what suggestion, what positive suggestion, do you make as a solution of this situation, as a curative agent of the fact which nobody denies, that employment is falling off?

Mr. GRIFFITH. Well, we have a couple of suggestions, one of which I included in my observations here that I had permission to read.

The CHAIRMAN. I just wanted you to summarize it. Just mention it briefly and any others that you may have.

Mr. GRIFFITH. This matter of separation allowance and other things of similar character would figure in our opinions in that regard. I think that any labor organization would be foolish, indeed, to fight anything that was a benefit to the large mass of people, and you might say a blessing to humanity.

The CHAIRMAN. But a separation allowance, obviously, provides only temporary relief and gives the displaced worker a certain period, according to the length of time to which it is made to apply, to look for another job.

Mr. GRIFFITH. That is correct.

The CHAIRMAN. But the story that is told to us is that this phenomenon appears in every industry, at least in those industries which are operating on a large scale. We had Mr. Hook here speaking for one part of the steel industry, and he acknowledged that there is such a thing as technological displacement. We have had spokesmen for the railroads here—Mr. Parmelee, head of the Bureau of Railway Economics, gave us at length descriptions of machines which take the place of men, and the production on the railroads, just like

the production on the telephone system, has been increased with fewer employees.

And so one could go from one industry to another, particularly to those industries which are affected by technological advance, and while it must be acknowledged that new industries are constantly being created by invention, nevertheless the unemployment problem remains because the workers who are displaced in the most instances are those who have been trained in the particular line, like your telephone operator, like the rolling-mill worker, like the track layer on the railroads who, when they reach a given age of 40 or 45, are unable to adapt themselves to any other employment.

Now those are the persons, from the human point of view, that society and industry must take care of. They are not taken care of except temporarily by your displacement allowance. Do you have any other suggestions?

MR. GRIFFITH. The answer, in my opinion, Senator, is we have to have more business. Although the telephone companies are aggressively promoting sales, I don't think that they have anywhere near reached the point of increasing the sales that are possible. I think that would be their contribution to the matter, to try to get more business. There are many people who don't have telephones. Many people who do have them don't have enough. The business could be increased enormously. I see no saturation point in years and years.

THE CHAIRMAN. But new business cannot be secured, can it, unless the masses of the people are able to pay for it?

MR. GRIFFITH. That is correct.

THE CHAIRMAN. Mr. Ford, of the Ford Motor Co., testified to us with respect to the growth of the motorcar industry. He was an ideal witness because he represented the company which was the pioneer in the field of mass production, and he showed that the market for the Ford car was opened when the Ford price was reduced to such a level that it became possible for persons who had been unable to buy high-priced cars to buy the cars that the Ford Co. was making. So it becomes necessary, does it not, to open up a new market by increasing the capacity of the people to buy?

MR. GRIFFITH. That is correct; but here's where the rub comes, Senator, in the case of a utility. Once the price is set it is very difficult to increase it. Therefore it might be most interesting—

THE CHAIRMAN (interposing). You mean to decrease—

MR. GRIFFITH. An experiment might be made, say in a certain community, of making a drastic cut in their rates just to see what would happen, providing, of course, that it was strictly understood that it was merely an experiment. It might be advisable to reduce rates to see if they could make more money, as much money as they did before, and at the same time have more equipment in use and more people employed. That would be following the tactics of the Ford Motor Co. As I understand it, they have more people employed than they did before, even though they use these technological methods.

THE CHAIRMAN. Perhaps if it is a good thing for business to reduce price in order to promote distribution, it might also be a good thing for Government to reduce taxes as a stimulus to business in reducing prices.

Mr. GRIFFITH. I expect that would be received with considerable favor by most telephone utilities. They make much of their tax bill in their annual reports, figuring out how much they are per employee, and it reaches an enormous figure per employee that they pay out in taxes for various governments.

The CHAIRMAN. If a reduction of taxes could be accomplished by some effective method of preventing the acknowledged abuses in business which have resulted in the past in holding up prices, and in concentrating control, perhaps everybody, including the Government, would benefit from that method.

Mr. GRIFFITH. You might have something there, Senator.

The CHAIRMAN. I think I have.

Mr. GRIFFITH. I have a few observations that won't take very long.

As I mentioned before, my training has been from the engineering standpoint, and therefore we have to throw figures around a little bit, and it is interesting to make contrasts of figures occasionally. Let's see what happens. You heard testimony yesterday as to the effect of the enlightened policy of the Bell System in retaining certain people in employment. They employed 387,023 people in 1929 and 285,550 in 1938—a decrease of 26 percent. People who are interested in playing around with figures might apply that same figure of 26 percent to the total employment in 1929, which was 36,000,000. You will find that if you do that you will get a considerably larger figure than the total unemployed that you now have.

I thought that was rather interesting.

SUGGESTIONS FOR CUSHIONING DISPLACEMENT

Mr. GRIFFITH. The National Labor Relations Act and the Fair Labor Standards Act contain specific guaranties designed to protect certain rights of labor. Through normal collective-bargaining procedures with industry some progress on this problem can inevitably be made. Nevertheless, industry, especially such as the telephone industry, which is affected with a "public interest," should assume a degree of public and social responsibility so that its employees should not have to pay for the introduction of technological methods and devices by the outright loss of their jobs.

A study of the telephone industry will reveal that it is a self-contained industry. Workers displaced by technological improvements do not have the opportunity at present, but they should be absorbed in the regular labor turn-over.

(Mr. O'Connell assumed the chair.)

Planning on the part of telephone management in advance of introducing technological improvements should include notice to displaced workers far enough ahead to permit this worker to attempt employment rehabilitation. The employer should go so far as to assume a social responsibility of vocational guidance and training.

We know that these observations are not necessarily new or offer a solution, but we know they are at least an advance over present conditions in our industry.

The railway brotherhoods have had agreements with certain railway carriers which, incidentally, are public utilities. These agreements provide for compensation to employees whenever they lose their jobs through consolidations or mergers of two or more carriers.

In brief, such displaced railway workers receive the equivalent of their last monthly pay for the period indicated, which was: 1 to 2 years, 6 months' pay; 2 and less than 3, 12 months'; 3 and less than 5, 18 months'; 5 and less than 10, 36 months'; 10 and less than 15, 48 months'; and 15 years and over, they receive 60 months' pay, or 5 years.

Mr. PIKE. Where is this, Mr. Griffith?

Mr. GRIFFITH. In certain railway brotherhoods—agreements with some of the railroad carriers.

Provided such displaced employee did secure reemployment elsewhere at less than the above equivalent before the time expired, then he received the difference from the railroad carrier.

In a United States Supreme Court decision, No. 343, October term, 1939, the *United States and the Interstate Commerce Commission, appellants, v. Frank O. Lowden, James E. Gorman, and Joseph B. Fleming, as trustees of the Chicago, Rock Island & Pacific Railway Co., and so forth*, decided December 4, 1939, there is a further point of interest which could also be made a partial solution to the technological displacement problem.

The question in this case concerned a railroad reorganization in which the trustees applied to the Interstate Commerce Commission for authority to lease another railroad and properties thereof to themselves (the trustees). The Commission found the rates, routes, and so forth, would result in no change to the public. They also found that the accounting office of the leased railroad could be eliminated, which would result in annual savings of \$100,000, which was to be effected through the ultimate dismissal of 49 accounting employees and the transfer of 20 others to the lessees' main offices. The Commission also found that the welfare of the employees affected by the elimination of the accounting office is one of the matters of "public interest" which the Commission must consider in the proceedings under section 5 (4) (B) of the I. C. C. Act as amended.

It accordingly authorized the lease upon the conditions which it found to be just and reasonable: that for a period not exceeding five years each retained employee should be compensated for any reduction in salary so long as he is unable, in the exercise of his seniority rights under existing rules and practices to obtain a position with compensation equal to his compensation at the date of the lease; that dismissed employees unable to obtain equivalent employment be paid partial compensation for the loss of their employment in specified amounts and for specified periods depending on the length of their service, and that the transferred employees be paid their traveling and moving expenses including losses incurred through being forced to sell their homes. The maximum cost of compliance with the conditions, it was found, would be \$290,000 spread over a period of five years, during which the savings effected by the lease would be not less than \$500,000. The Commission found that the proposed lease, with the specified conditions, "will be in harmony with and in furtherance of our plan for the consolidation of railroad properties and will promote the public interest."

A district court enjoined the Commission from enforcing its order, whereupon the case was appealed to the Supreme Court, which reversed the lower court and sustained the Commission, and said in part:

The fact that a bill has recently been introduced in Congress and approved by both its Houses, requiring as a matter of national railway transportation policy the protection of employees such as the Commission has given here, does not militate against this conclusion. Doubts which the Commission at one time entertained but later resolved in favor of its authority to impose the condi-

tions, were followed by the recommendation of the Committee of Six that fair and equitable arrangements for the protection of employees be "required." It was this recommendation which was embodied in the new legislation (S. Rept. No. 433, 76th Cong., 1st sess., p. 29). We think the only effect of this action was to give legislative emphasis to a policy and a practice already recognized by section 5 (4) (b) by making the practice mandatory instead of discretionary, as it had been under the earlier act.

This decision establishes a precedent and shows by judicial determination what congressional intent appears to mean in protecting displaced railroad workers under such conditions.

Possibly, if collective bargaining cannot secure fairer results, then corrective legislation may be the answer. We solicit your studies and action upon this great problem. We would actively participate in any movement to cooperate with industry to find an honest solution.

That concludes my remarks.

(Senator O'Mahoney, the chairman, now presiding.)

The CHAIRMAN. Thank you very much.

Do you have any concluding questions?

INTRODUCTION OF LETTERS RELATING TO INSURANCE HEARINGS

Mr. PIKE. Possibly, Mr. Chairman, I had better put in this material the first thing this afternoon, on a matter of the insurance.

The CHAIRMAN. If you care to put them in now it will be perfectly all right.

Mr. PIKE. If you remember, the committee authorized you to appoint a committee to examine certain letters which had been received from insurance agents, following which you appointed Mr. O'Connell, from the Treasury, and myself from Commerce, to look over these letters, of which there were about 2,000.

The CHAIRMAN. These 2,000 letters had been received by the S. E. C. in response to their inquiry, and then the committee delegated to this subcommittee, consisting of the two of you, the task of making a selection from that group, and you now have completed that selection.

Mr. PIKE. Yes, sir.

We went over the 2,000 letters and have selected—I might say the selection was done to a great extent independently. We didn't get together until after the selection was done, Mr. O'Connell and myself, and we selected 17 which we consider typical, and which we wish to present for the record, together with a copy of the Commission's circular letter to which these were replies. They have been selected without consulting representatives of the S. E. C., since it was our understanding that you wished it to be done entirely independently.

These letters are of very high average quality and show a good deal of thought on the part of the agent. There is also considerable uniformity among the replies in answering the questions which the Commission put. Most of them felt that agents should be better trained and more carefully selected. Most of them felt that part-time agents should be eliminated and that changes in method of compensation would be desirable, although there was disagreement. Most of them though they ought to get more. Most of the agents who expressed an opinion thought that there were many opportunities left for further sales, but there was some lack of balance between the number of agents selling and the size of the market.

It was frequently expressed that this lack of balance might be adjusted through the elimination of the unfit and unqualified agent. Most of these letters were certainly not from disgruntled older agents or agents who have some personal ax to grind. In general, they are constructive, reasoned replies from men who have unquestionably had some success in their field and who are proud of their position in the life-insurance business.

Now here is a point which I would like to have consideration for. Many of these agents requested that their replies be kept confidential, and on that basis there has been some editing of the letters in order that the name of the sender cannot be determined from the context. There has been, however, no chance in the substance. In looking these over I find that, in my opinion, further editing of names and places is desirable, and I would request that before they be made public, certain other eliminations of places and names be made.

The CHAIRMAN. You mean merely to strike out any indication that might identify the authors of the letters, since they have requested that their names not be made public.

Mr. PIKE. Yes, sir; so that there should be no possibility of the identification of the writer or the company for whom he works or where he is located.

The CHAIRMAN. The letters will be received for the record with that understanding.

(The documents referred to were marked "Exhibits Nos. 2587 to 2604" and are included in the appendix to Hearings, part 28, pp. 15634-15641.)

The CHAIRMAN. The committee will stand in recess until 2:30 this afternoon.

(Whereupon, at 12:50 p. m., a recess was taken until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The hearing resumed at 2:40, at the expiration of the recess. Senator O'Mahoney, the chairman, presiding.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman, this afternoon's witness, winding up the testimony with respect to the electrical field, will be Mr. James B. Carey, general president of the United Electrical, Radio, and Machine Workers of America, and national secretary of the Congress of Industrial Organizations.

The CHAIRMAN. Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. CAREY. I do.

TESTIMONY OF JAMES B. CAREY, GENERAL PRESIDENT OF THE UNITED ELECTRICAL, RADIO, AND MACHINE WORKERS OF AMERICA, AND NATIONAL SECRETARY OF THE CONGRESS OF INDUSTRIAL ORGANIZATIONS, WASHINGTON, D. C.

Mr. CAREY. I ask the committee's permission to enter in the record a statistical brief which I mention and discuss during my testimony.

The CHAIRMAN. That will be presented as an exhibit?

Dr. ANDERSON. It will be exhibit No. 2605.

The CHAIRMAN. Without objection, it is so ordered.

(The document referred to was marked "Exhibit No. 2605" and is included in the appendix on pp. 17412-17424.)

The CHAIRMAN. These figures all apply to your industry, the electrical and machine manufacturing industry?

Mr. CAREY. That is right.

The CHAIRMAN. And what is the source of the figures which you are presenting here as conclusions?

Mr. CAREY. The sources of the figures are all outlined in the statistical brief. This is just a summary of what is shown in that brief. We go into greater detail there, easily secured from the brief itself.

The CHAIRMAN. What is your full name?

Mr. CAREY. James B. Carey.

The CHAIRMAN. And what position do you occupy?

Mr. CAREY. The position of general president of the United Electrical, Radio, and Machine Workers of America.

The CHAIRMAN. How long have you held that position?

Mr. CAREY. I have held that position since the inception of the organization in 1936.

The CHAIRMAN. What is your own personal business?

Mr. CAREY. My own personal business, my trade, is in the radio manufacturing field.

The CHAIRMAN. How long have you been so engaged?

Mr. CAREY. I worked for 6 years at the Philco Co. in Philadelphia.

The CHAIRMAN. What was your training for that business?

Mr. CAREY. I attended Drexel Institute studying electrical engineering, and also attended the Wharton School of Finance in Pennsylvania.

The CHAIRMAN. Did you receive a degree from any of these institutions?

Mr. CAREY. No. I attended night school.

The CHAIRMAN. When did you complete your educational training?

Mr. CAREY. I completed the educational training while I was working in the plant, and engaged in labor-union activities about 1935.

The CHAIRMAN. How long have you been engaged in this trade?

Mr. CAREY. In the trade 6 years.

The CHAIRMAN. Six years all told?

Mr. CAREY. More than 6 years; 6 years for one company. I worked in radio previous to that for a short time.

Dr. ANDERSON. Mr. Carey, by way of an introduction, would you tell us just what your industry comprises? When you speak of these over-all figures, to what particular branches of the electrical industry do you refer?

Mr. CAREY. I suppose the best and simplest way is to name the companies and the products they manufacture. Our organization covers such companies as General Electric, Westinghouse, Allis-Chalmers, R. C. A., Philco, and all the other electrical manufacturing companies. They manufacture such products as generators, motors, some business-machine equipment. In the machine field it is the manufacture, of course, of consumer products such as refrigerators and radios, and all other electrical equipment of that type.

Dr. ANDERSON. I raised the question, Mr. Carey, to bring out the nature of the industries with which your organization deals.

Mr. CAREY. I am submitting to the committee a rather detailed statistical brief covering the important facts of technological change as it occurs in the electrical and machine manufacturing industry, an industry in which approximately two-thirds of all employees are working under the union contracts and collective-bargaining status of the United Electrical, Radio, and Machine Workers of America.

Because it is difficult to grasp complicated statistical pictures when presented verbally, and because the students who will make the best use of this material necessarily prefer to work from the documents themselves, I shall not attempt to handle this wealth of factual material at this time. Instead, I want to attempt to simplify the problem, to show the gist of the situation as I see it.

Let me first sum up, however, the factual points made in the statistical brief I am filing. We show the following things about our industry—and I will simply run over them rapidly so that you can get the general outline of the picture, which the brief will fill in in much greater detail.

EFFECT OF TECHNOLOGY IN THE ELECTRICAL INDUSTRY

Mr. CAREY. We show:

That technological improvement in our industry has been much more rapid than in industry generally.

That our industry has a special bearing on the question of technology, in that our industry is actually supplying an increasing amount of the very machinery by which *other* industries make their technological advances.

That the actual nature of this special type of machinery which aids technological advance in other industries is changing, so that *control* instruments make up an increasing percentage of the product, in contrast to mere recording instruments, which do not function as controls.

That because our industry is highly concentrated, both as to the geographical location of plants and as to ownership of principal plants, any technological improvement spreads throughout our industry very rapidly.

That in our industry, operations which formerly required a relatively large number of skilled workers are being broken down into smaller operations which achieve the same or better production results, but which require fewer skilled workers.

That as a result of the above, the ratio of skilled workers to all workers in our industry is rapidly falling.

That in our industry the increase in productivity per man-hour worked has been very great—so much so that we are confronted by the following facts:

1. Hours worked per week today are about 25 percent under 1929.
2. Employment is about 16 percent under 1929.
3. Productivity per man-hour in the heavy goods section of our industry is 32 percent above 1929, and 29 percent above so recent a year as 1937.
4. In radio, productivity is more than 100 percent higher than in 1929.
5. Defining productivity per man-hour in 1929 as 100 percent, we find that by 1939 it has risen to 137 percent.

6. The labor cost for each \$100 of value produced in 1939 was about 14 percent less than in 1937. In the radio section of the industry, the drop in labor cost since 1937 has been about 23 percent.

These are a few of the outstanding facts with which we are faced in the electrical and machine manufacturing industry, and which are generally characteristic (in different percentages, to be sure) of all industry.

All our studies, the studies of other workers in the field, and most important of all, the day-to-day practical experience of hundreds of thousands of employees and ex-employees in our industry, contribute to the emphasizing of this central fact:

That the benefits of the extraordinary technological improvement that has taken place in this country are unfairly divided, as among the men and women who do the work, the men and women who buy the goods, and the men and women who own the industry.

So great has been the technological change in our industry that it has been possible for the companies to agree in many cases to *increased* wages for *fewer* employees, to reduce the sales price of the product, and still have enough left over for substantial increases in profits.

In other words, the savings resulting from improvement in method and in machines are *so large* that a small fragment of the savings can be (and sometimes is) given in the form of slight increases in pay to those employees who *survive* technological displacement and another small fragment can be (and sometimes is) given to those consumers who *survive* the disaster of technological displacement; and after both these fragments have been dealt out, there is still enough left for maintained and, today, increased rates of profit.

The increases in wages, when there *are* increases—and this is by no means characteristic of all industry—do not begin to make up for the total decreases in wage money paid out.

Now, in the years preceding 1929, it could not be said that industry was doing an adequate job in matching product with purchasing power. Even in 1929, industry was turning out so much less in purchasing power than in product, that our economic machine clogged up and has remained clogged up ever since then. That was the case in 1929 and previous years, when product was substantially in excess of purchasing power.

So we can imagine how much more acute the crisis in the field of technological change has become today, when it is possible to turn out *still more* product while turning out *still less*, much less, purchasing power.

Let me refer again to our statistical study, to emphasize these points in another way.

Our industry can today produce the same amount of electrical machinery as was produced in 1929, with about *24 percent* fewer workers.

The radio division of our industry can today produce the same amount of radios as in 1929, with *only half* the number of employees.

And in the interval between 1929 and 1939, thanks largely to the activity of organized labor, hours of work per week were reduced in the industry. Indeed, if employees were today working the same number of hours they worked in 1929, then the crisis would be still more acute—for under such circumstances two-thirds of the number

of employees needed in 1929 could now produce the same amount of produce as was produced in that year.

When the situation is approached from another point of view, the same basic facts are italicized. When we relate our facts to the value of the product, we see that the labor cost for each \$100 value produced has declined, for the entire industry, about 15 percent from 1929 to 1939.

In our industry, and industry generally, it is today possible to turn out still more product while turning out still less in purchasing power.

This is the very issue, of course, on which the two main schools of economic thought are divided today.

What we call, and can call quite calmly, the "reactionary" school, says: "In order to match purchasing power and production, let us cut purchasing power still further and cut the amount of product accordingly." The other school, my school and, I believe, the obviously correct school, says: "In order to match purchasing power with product, let us increase the amount of product still further and increase the amount of purchasing power accordingly."

These two schools go by all sorts of names. A very descriptive phrase for the reactionary school is the "economy of *scarcity*" phrase; it emphasizes the fact that partisans of this school believe that the way to balance the total economic and productive budget is by slashing at the product in order to keep it within reasonable range of the purchasing power.

But the two schools of thought have sharply different effects on our Nation.

A school which bases itself on the need to pull product *down* to purchasing-power levels, rather than lifting purchasing power levels *up* to the amount of product we can produce, yields what a philosopher might call "incidental" results of a disastrous nature.

I will not call these side results "incidental" because they are the results that have put this Nation in a predicament where some 12,000,000 living human beings are out of work, and where at least half of those who do work get along on substandard scales of living conditions.

What it comes to is that by some perversity of thought and thinking, we have reached the point where the brilliant results of the finest managerial and scientific minds in the Nation are being used for the *rapid impoverishment* of the people.

That this impoverishment is a fact, no one of whatever school can deny. It is all around us, and there are not, I suppose, more than 300,000 persons in the United States who do not have direct, personal knowledge of this shocking impoverishment.

Let us not be deceived by the false notion that "machines are doing the work that men used to do." That is close to the truth, but not quite close enough, for machines without men cannot do any work.

So vast has been the output of method, procedure, and mechanics in this field, and so astounding are the results that it is easy to lose sight of the fact that machines are but *instruments* for the *multiplication* of manpower.

This point is obvious, when we consider the simpler machines. A hammer, for example, does not do any work. A hammer merely multiplies the effectiveness of the human being who uses it. A wheel-

barrow does not carry any bricks; it enables a living human being to carry more bricks than he could do otherwise; a wheelbarrow thus does not do the work, but multiplies the work-power of the man who uses it.

This situation is easy, as I say, to grasp in the cases of the hammer, the wheelbarrow, and perhaps in the cases of the simpler modern machines. So let us not lose sight of the fact that the same situation applies even in the most advanced instances. A giant machine, performing, as they say, "automatically" very complicated operations is not doing the work itself, but is enormously increasing the output of workers.

The brainpower that once had to stand at a machine and control it is now embodied, in some operations, in a punched card or roll which controls the operations. Gear ratios and cams, set once and for all by a human brain, vastly extend the power of such a human being. Thus, in the most advanced cases of technological change, as in the more primitive ones, we are confronted not by machines which do the work themselves, but by instruments which enormously *multiply* the work of living men and women.

I have just stressed the role of control, through human brainpower, in advanced technological operations, and I did so, first, because in our industry (as our brief will indicate) there has taken place a great rise in the importance of *control* instruments, and secondly, because it is far too common to forget the fact that *all* human labor is valuable because of its brainpower.

In keeping with traditional concepts, we are, of course, fully familiar with what is meant by "skilled" as against "semiskilled" and "unskilled" labor. But this must not blind us to the fact that the humblest unskilled worker is hired primarily for his *brain*, not his brawn. The ditch digger, ordinarily considered a strictly manual laborer, needs plenty of muscle to dig his ditches, but it is his *brain*, which tells him *how* to dig ditches, which makes his work valuable, and it will be noted that the very simplest task of so-called "brute labor" requires a human brain for its performance.

The very simplest task requires a technique, however simple both the task and the technique may be, and both task and technique are beyond the range of even the strongest creatures if they have not human brains.

Very complicated operations require highly coordinated brain power, highly developed planning, highly developed thinking. The new tendency in technological change is to do this thinking, this planning, once—and then to embody it in routines, punched cards and rolls, ratios and gears and cams. Once this has taken place, it is then possible for "semi-skilled" workers to carry out operations which, otherwise, would require skilled workers.

So, as these control and planning operations gain in prevalence, the lines between these classes of labor grow vaguer and vaguer, and the practical effect is to reduce all labor to a common level; the skilled workers are pushed down toward jobs which require of them less than their full capacity, and the entirely unskilled workers starting out in industry are forced to learn, and learn quickly, tasks of a semi-skilled nature. The old criteria of skill disintegrate; they cease to have the practical meaning they once had—and along with the disintegration of criteria of skill goes, as we all know, a disintegration of the wage structure.

We know that the old inequality of product and mass purchasing power produced with disastrous regularity cycles of depressions. Periodically, the accumulation of product in relation to purchasing power would grow too great, and this accumulation would discharge itself over a period called a depression.

So vast has been the technological change since 1929, that the cycles have enormously speeded up. Nowadays, we cannot get out of one depression before another starts up; one comes on the heels of another so fast that, as far as the ordinary people of this country know, there has been one continuous and steadily worsening depression since 1929 itself, regardless of what ups and downs may have been the experience of those closer to the top of the structure.

When the question of a remedy comes up, as it is coming up in these committee sessions and throughout the Nation with increasing emphasis, we have, it seems to me, no more than a few directions in which to look.

REMEDIES FOR UNEMPLOYMENT

Mr. CAREY. First, the leaders of industry can themselves, if they will, take the necessary steps to equalize the inequalities. The first answer, then, is private industry.

Second, labor can and perhaps must, though its normal processes of collective bargaining, press and achieve its demands for equalization.

Third, if labor by reason of obstacles placed in its path cannot, and if industry will not, then the Government must step in.

And the fourth answer, one that labor rejects with all the power at its command, is the far too prevalent answer that there is no answer.

Excluding this fourth answer, the "no" answer of the cynical or defeatist, labor would have good reason to expect that all three of the other answers might yield good results. Private industry can do something, labor can do something, and Government can do something. That, of course, is exactly the reason why we of organized labor have never let up in our demand that a genuinely representative conference be called on the subject, where leaders of government, labor, farmers, professional groups, industry, finance, all, can get down to the practical problem.

"What can industry do?"

If the leaders of industry were voluntarily to agree that whenever productivity is increased through technological change, the benefits would be passed on to labor in the form of increased wages, decreased hours, and increased number of jobs, and passed on to the public in the form of decreased prices, or if industry would even go part way in this direction, then a beginning would have been made.

"What can government do?"

Government can first do what it is not doing today, and that is to attack the problem directly. It is all but incredible that when the country is faced by this paramount problem, the problem which overshadows and embraces every other national problem, the Government should still remain silent and motionless in regard to the solution of the problem.

Government can take steps to see to it that when industrial leaders do take steps in the right direction, they are encouraged and re-

warded; and that the employers who decline to take such steps are not encouraged or rewarded. Government can keep the channels of collective bargaining clear for labor. Government can and must bridge the gap between what must be done and the percentage that private industry is able or willing to do.

We of organized labor can and are doing what we see as the jobs for us—and I do not believe it can be said that any substantial group has more actively taken the lead than labor.

In our own industry we are introducing as rapidly as possible the contract provision on certain phases of technological change. In an increasing number of our contracts, as in our General Motors electrical division contract, the question of speed-up is declared by contract to be a subject of collective bargaining.

Speed-up is, to be sure, only one primitive kind of technological change and is never a decisive matter when dealing with the full impact of technology. We anticipate the need for making all matters of technological change subject to collective bargaining.

We are pressing for a reduction in the work week, without any reduction in weekly pay.

Our own studies show that if as many employees were working in our industry as in 1929, but were working on a 35-hour week, then total production would be approximately the same as in 1929.

Just as important, all of organized labor is repeatedly calling the attention of working people to the problem itself. "Technology" is no longer a strange word for working men and women, for they have seen this thing called technology force more and more of their number out of jobs.

The normal, proper operation of technological change is to increase the amount of product without increasing prices or decreasing purchasing power.

Instead, technology is today operating to reduce the number of jobs, to result in wage payments which, despite certain individual areas of increase, slowly decrease in total amount. Technology cuts the prices to the consumer of certain classes of consumer goods, but along with that it destroys the purchasing power to a still greater extent. What good is a 10-percent price cut if whole areas of purchasing power are wiped out? A 10-percent or a 20-percent or even a 50-percent reduction in price means nothing to the family that has lost its income. The 12,000,000 jobless cannot buy the goods at either the full price or the cut price. An average family which gets along, as do nearly half the families in the United States, on \$16 per week or less is not effected by great price cuts in autos, refrigerators, radios, or other products in fields where technological change operates.

The new approach to the problem, the approach which involves the substantial increase of purchasing power, does not involve, as many believe, the abolition of profits.

To be sure, it may call for lower rates of profit, but the profit system is by no means destroyed; indeed, it is preserved far more securely than by this contemporary process of more and more profits for fewer and fewer people.

Our interest is not in how much goes to profit but in how little goes to the people. Today the penalties inflicted on the unemployed and on the substandard-wage groups amount to economic death. If

a worker gets caught in the expanding desert of unemployment, his income disappears.

You will find that the overwhelming majority of our American people will not object to large and even very large incomes on the part of owners and managers as long as the income of the average American family is high enough to support a decent American standard of living.

We do not care, and the people do not care, if there be a certain group which pays itself \$25,000 or \$25,000,000 per person in salaries and dividends and profits. What we do care about is the improvement of conditions of those who get from zero to \$2,500 and \$5,000 per year, especially the group below \$2,000 annual income.

We say, and we know, that the Nation can produce enough to give all American families an American income, and that doing this does not preclude the payment of much higher incomes to employers and owners.

A reasonable income for all does not preclude but in fact guarantees, higher incomes for owners and managers.

I say "guarantees," because no one can look at the picture today without realizing, as many of the well-to-do do realize, that there is nothing stable or guaranteed in eternity about higher incomes now. Today the high incomes rest on a base that is dissolving before our very eyes—dissolving into misery, unemployment, substandard wages, poverty. Jobs for all, reasonable incomes for all, can stabilize this base, can make it solid and permanent and healthy. That is what we ask industry and government to do.

Mr. MAGINNIS. Mr. Carey, I didn't want to interrupt, but I was rather interested in one paragraph on page 5. You say:

What we call and can call quite calmly the reactionary school, says, "In order to match purchasing power and production, let us cut purchasing power still further and cut the amount of product accordingly." The other school, my school, and I believe the obviously correct school, says, "In order to match purchasing power with product, let us increase the amount of product still further and increase the amount of purchasing power accordingly."

You don't mean that is just your view? What school of thought has the first view?

Mr. CAREY. The first view is held by the people who state we are overproducing in this country. There are a great many who believe that, that we are now producing more than we can use. I don't say that this thought is original with me about the other school which believes we should raise the standard of living of the people and give them an opportunity to use all we produce today, and more, by increasing the amount of money that they have at their disposal to purchase those products. One school of thought, the reactionary, or scarcity, school of thought, believes in reducing the amount of production to meet our present consuming power. The other school says, increase the amount of production and increase the amount of purchasing power in order to match that.

Mr. MAGINNIS. Do you believe that any large industry that is attempting to make a success of its business deliberately attempts to cut the purchasing power still further, and cut the amount of the product accordingly?

Mr. CAREY. They do that for their own immediate advantage. I do believe that there are a great number of industries, even far more

companies, that are a drain on our whole economy, because they produce a great deal in product and little in purchasing power.

Mr. MAGINNIS. That is more or less of a general theoretical thought. You don't know of any industry that deliberately does that, do you?

Mr. CAREY. Some of them look at it not in the sense that they are part of the over-all production plant, but from the standpoint of their own immediate profit. In my own industry I know of companies that I could name that actually are a drain on not only our industry but our whole economy because they pay so little wages that the people can't afford to buy the products they make, as well as any other products of the same standard. The whole radio-parts industry is a drain on our economy because of the low wages that they pay.

Mr. MAGINNIS. What you mean is that the effect of their operation is that, not that their intention is that? The effect of their operations is to cut the purchasing power still further, but you don't mean to say that that is their plan and their school of thought?

Mr. CAREY. It is just the way it works out. The school of thought is a group of people who believe in limiting the amount of production. (Mr. Pike assumed the chair.)

Dr. LUBIN. Isn't it true, Mr. Carey, that there are many industries in this country, who, when the price level falls, immediately curtail their production and thereby cut down employment, thereby cut down pay rolls and purchasing power, but theoretically, at least, if they had continued to produce, they at least might have limited the extent to which employment would have fallen in the economy as a whole?

Mr. CAREY. Yes, sir; we have some companies in the radio industry that went out of business because the profit per unit was not sufficient for them. They just closed their plants and said, "When the time comes when our profit per unit is sufficient we will go back into the manufacture of radios," and they are not small companies by any means.

Dr. ANDERSON. Do you mean they would forego even small profits rather than to break the price structure?

Mr. CAREY. Yes, sir.

Dr. LUBIN. You might even get the reverse situation, where you operate only a certain level of capacity and keep prices up, whereas if you lowered your prices it might be possible that you would increase your level of capacity and increase employment and purchasing power too.

Mr. CAREY. Except in an industry where there is a saturation point rapidly being reached. As I say, in radio you arrive at the point where you feel that the market is not enlarging, in fact the market is contracting. In the radio field today all we can do is replace the old radios that are being worn out, and the only other market is for people to have two radios in their homes instead of one. In other words, there are not enough new markets.

Dr. LUBIN. But you might stimulate replacement by lowering the prices.

Mr. CAREY. Up to the point where the people have at least some money to buy some radios. I would say there is not a large market for radios today because all the people who can afford to buy a radio have a radio.

Dr. ANDERSON. And is it your judgment, Mr. Carey, that, generally speaking, in the industries with which you have contact, the policy of maintaining the price is pursued regardless of its effect?

Mr. CAREY. No, sir; I don't believe that is general.

Acting Chairman PIKE. There has been a great drop in the general retail price of radios in the last 8 or 10 years.

Mr. CAREY. A tremendous drop, and much better radios; there are more work units per radio.

LEVELING OF SKILLS

Dr. ANDERSON. I would like to move over to a discussion of a problem that interests all of us, one upon which you touched in your paper. You mention a problem that has been of great concern to the students of this matter of technology and its effect upon workers, saying—

As these control and planning operations gain in prevalence, the lines between these classes of labor grow vaguer and vaguer, and the practical effect is to reduce all labor to common level.

Do you believe, as a result of your experience, that a general and progressive degrading of labor is occurring?

Mr. CAREY. Yes, sir; it is; there is not as great need for skill today in what we term the "skilled trades" as in the past. For instance, machine operators today who were formerly classed as machinists are today classed as semiskilled rather than skilled workers because they operate one type of automatic machine.

Acting Chairman PIKE. Following that point a little further, Mr. Carey, these machines as installed do require a certain type of skill in repair and adjustment; that is, most of these things are set up so tight for hair-line measurements or better that they do require something of a pool in almost every factory of a few very highly skilled mechanics.

Mr. CAREY. Yes, sir; but once they are set it doesn't require a man as skilled as the one who made the setting to stay with that machine.

Acting Chairman PIKE. That is true; he comes around only once a week, or when the operator complains or when the spoils are getting too big, but there is always that pool of very highly skilled mechanics in a highly mechanized factory, not very large.

Mr. CAREY. Yes, sir; and becoming smaller and smaller.

Dr. LUBIN. Mr. Carey, I was very much interested in your brief, particularly that part of it which deals with the low cost of each unit of productive capacity. You mentioned television as a case in point. Is it your experience in the industry that that process is going on? In other words, put it this way: whereas, formerly it cost you \$10,000 to buy a machine that produced a thousand units, now for \$100,000 you can get a machine that will produce, say, 1,500 units. Is that trend going on actively in the electrical industry?

Mr. CAREY. Yes, sir; and the rate of acceleration is not hesitating; it is increasing.

Dr. LUBIN. That means we are in position today to increase the productive capacity of the Nation without investing more money as compared to what we used to have to invest.

Mr. CAREY. Oh, yes, sir. In that particular reference I believe I mentioned that it wasn't by putting in new machines, it was just by adding to the machines already in and increasing capacity. We are far from reaching capacity in our industry and I doubt if other

industries will reach it. Without increasing the capital investment we could increase our capacity.

Dr. LUBIN. So as far as all this argument that one hears that we will have to have more and more and more investment if this country is to grow and the standard of living is to increase, the facts in your industry are to the effect that with relatively small increases in investment you get a much larger and increasingly larger volume of production.

Mr. CAREY. Correct.

Dr. ANDERSON. In connection with the degrading of workers, which seems to be of such great concern, you say in your brief, "Exhibit No. 2506":

This tendency has reached alarming proportions, for the ratio of skilled workers to the total labor force is continually dropping.

Were you referring there to the labor force engaged in electrical industries?

Mr. CAREY. In the electrical industry. I am referring primarily to the people who were formerly classed as skilled labor and are now classed as unskilled, or partly skilled.

Dr. ANDERSON. That led to your table on the importance of this problem in your industries, in which you show that skilled workers are 21 percent of the industry, semiskilled workers 52 percent, and unskilled workers 27 percent. The bulge apparently is in the semiskilled level. That is what they are degraded to?

Mr. CAREY. From skilled; yes, sir. For instance, a person in radio manufacturing in 1926 had to have a pretty complete knowledge of radio. He would make a radio. Today they don't require men of that type. They require men who know how to use a hand wrench and put on one nut or a few wires. Sometimes they don't even know what work they are doing. In some cases in our industry we have workers who have never seen a complete job that they work on. Today it doesn't require a great deal of skill to make a radio.

Dr. ANDERSON. Might it not mean also that you got a degrading of highly skilled craftsmen at the top and an upgrading of unskilled levels from the bottom into the semiskilled level?

Mr. CAREY. We know the number of skilled people required in a plant, and as we bargain collectively on job classification, the tendency on the part of the company is to reduce the classification so that they can give lower rates of pay. The effort on the part of the company is to put in new methods of procedure in order to reduce the labor cost, and in order to reduce the labor cost they change their classification. They don't give a person a wage cut, they just say that that classification is no longer necessary, no longer in existence.

Dr. ANDERSON. In negotiating you have split up the industry into a series of levels, each having its own job classification and its pay returns. Has the number of those classifications increased or decreased with advancing technology?

Mr. CAREY. The number of classifications has increased but not because of technology, in the sense of new methods of machinery; it is new systems on the part of the company that have become increasingly complicated. At one time they had three classifications, craftsman, helper, and apprentice; now they have broken it up into

27 different classifications. Every company uses a different method, and they use different names and different criteria to determine a classification.

DR. ANDERSON. And you feel that that split-up into more and more classifications does not mean an increase in skill, but rather degrading to a common level that could be called simply semiskilled.

MR. CAREY. That is correct; yes, sir.

Acting Chairman PIKE. On that matter I would like to get it clear in my head what you call semiskilled. I wonder if you would agree with me that a man may be highly skilled in a particular narrow application as you said a moment ago, a fellow who adjusts a particular part rather than the man who makes the whole radio, he may be very much skilled in that particular operation, he must be to be on the job, but he would still be a semiskilled workman. Does he have no breadth of adaptability, no training in, let us say, making the whole radio, the difference between the cobbler making the whole shoe and 200 people on the line, each doing one particular piece of work? He is nonadaptable to a great extent?

MR. CAREY. They could be very adaptable, but there is no use for the adaptability.

Acting Chairman PIKE. No; but the training leads him to be very narrow in a groove. Let's say there were another factor of a somewhat different kind; let's say I am a skilled workman, and I adjust a particular operation, and they say, "We don't have that operation here, so, as far as you are concerned, you are not a skilled workman." Is that somewhere in the range of what you mean by semiskilled or is it just a shadow line or rather a no-man's land between entirely unskilled people and a thoroughly skilled master mechanic who nobody doubts is a master workman? I am trying to get through my own head the definition of a semiskilled person.

MR. CAREY. The best definition would be that a skilled operation is one that requires an apprenticeship of, say, 3 or 4 years. A semiskilled operation may require certain ability on the part of the operator but not long training in learning the job.

Acting Chairman PIKE. No broad base.

MR. CAREY. Correct; it may take him some time to become skilled at that particular operation, but to learn the job itself is practically simple; say, 6 weeks of training would make him an operator capable of holding up his end on a production line. We hear a great deal about scarcity of skilled labor. We have thousands of skilled mechanics in the metal-trades field who are now working on production lines. In fact, our answer to the people who say there is a scarcity of skilled labor is to say, "Name the city and we will supply you any number of people who are skilled in that field."

DR. LUBIN. How long would you say it would take an entirely green person who has never been in any of the plants to reach his maximum earning capacity on the job that he happens to go into, taking the jobs by and large? In the automobile industry it is said that within 2 or 3 months a man reaches his maximum earning capacity on that particular job. How long would you say for the tool and electrical industry?

MR. CAREY. Two or three months is long; I would say 6 weeks, with few exceptions.

Dr. ANDERSON. Mr. Carey, what is the characteristic of a modern industry? You spoke a moment ago about a skilled craftsman's building a radio. What is the transformation that takes place in the industry which brings about this enormous degrading of labor?

Mr. CAREY. Of course, there is the production line. At one time, a comparatively few years ago, because the radio industry is very young, people would make a radio on a bench. That radio would be completely wired by one person—the parts would be placed on the chassis and he would wire it; in many cases do part of the testing. Then it would be passed along to another person who would finish the testing and, of course, pack it. Now, a radio starts out as a piece of metal as a base and they have a transformer put on it and it is placed on a long conveyor. Most of the conveyors today in large companies have about 150 employees on each side of the conveyor, and each person does one operation. About three-fourths of the way down the production line it says, "Turn the right side up," and they put the tubes in it and put it in the cabinet that comes along on another conveyor at the end of that production conveyor, and it goes out and is put in a box and on the train; it doesn't even stop.

Dr. ANDERSON. In other words, the characteristic of an industry changing from skilled labor to semiskilled is the belt line or the conveyor line? And then you mentioned a moment ago the increasing use precision instruments were having in the electrical industry and in other industries supplied by the electrical industry. Do you take it that such devices are in themselves an indication of advancing technology?

Mr. CAREY. Yes, sir; in our industry we manufacture equipment that is used to make a technological advance in other industries, so our industry provides an opportunity to determine whether the pace of technology will increase. We manufacture labor-saving devices for the automobile industry, the steel industry, and all others, and there our production of that particular line of goods is increasing.

Acting Chairman PIKE. Of course, your whole industry is based on the very latest technology. It is a technological industry from start to finish.

Mr. CAREY. It is a very advanced industry. We manufacture advanced equipment for other industries.

Acting Chairman PIKE. It was created by technology, and now other things are happening to it by technology?

Mr. CAREY. Our industry is highly centralized. That is, when there is a new way of doing things it rapidly spreads because of high concentration.

EFFECT OF PATENT RIGHTS ON TECHNOLOGICAL CHANGE

Dr. LUBIN. How far do you feel the patent situation affects the growth of technology in your industry?

Mr. CAREY. I frankly don't think it affects it a great deal.

Dr. LUBIN. You don't think it stands in the way of it moving faster?

Mr. CAREY. I don't believe anything stands in the way of its moving faster, except that no employer that I have met yet in our industry is willing to make anything he doesn't think he can sell.

Mr. O'CONNELL. What about passing the benefits of technology on to the consumers and others in the groups you mention as being interested? Might not the patent control or any other device which would constitute a monopoly control tend to slow up the passing on of the benefits?

Mr. CAREY. It could either slow up or increase it.

Mr. O'CONNELL. Increase it?

Mr. CAREY. It could.

Mr. O'CONNELL. How do you think it actually operates in practice? I take it you don't think they are being passed along rapidly enough, or else you wouldn't have made the point.

Mr. CAREY. At some points in our industry there is what could be termed "an actual increase of rate" of passing it on to the people.

Mr. O'CONNELL. How would that be?

Mr. CAREY. For instance, they may try to pass on the results of a very efficient manufacturing process if they have collective bargaining to operate certain checks in certain fields, and we keep pressing for reduction of number of hours and increase in pay at the same time, the industry can move ahead and meet the requirements and at the same time do a good job, say, for the consumer. Where they have monopoly, or at least some form of it, they can plan their production; they can do a far better job than they could otherwise. You don't have to worry much about styles; they can plan their styles and the needs of the consumer and determine what their market will be. That is the effect, I believe, only in certain branches of our industry. In certain other branches, where there is less information available, say in television and things like that, it is doubtful what could be done. A lot of people are saying television is going to be the solution of all our problems, that a new industry is arising which is going to meet our needs. I believe 50,000 employees can manufacture all the television our people can use, so I don't think that is the solution.

Mr. MAGINNIS. Mr. Carey, don't you think it would be more desirable for the consuming public, as well as for labor, if certain patent rights owned by large corporations were permitted use by licenses so as to have competition in manufacture to cover more ground in production?

Mr. CAREY. I believe so; yes, sir.

Acting Chairman PIKE. There is one thing on my chest I would like to get your opinion on. On the matter of reduction of hours, do you regard further reduction of hours as mostly a straight device to spread employment, from 40, 42, or 44, or whatever standard hours are at the moment, that that further reduction is desirable on the point of view of more leisure for the workman or less fatigue? I would like your guess as to where the point comes when the lessening of fatigue has lost its importance and where lessening of hours comes to be a straight work-spreading campaign. Thinking back to the 12-hour day, 7-day week, which isn't so far behind in some industries, and certainly the 60-hour week which is quite recent, and then coming down to 54, 48, and so forth, somewhere there is a point in there where from a good many points of view there is no further advantage to the person. I am speaking of a man who used to work 70 and sometimes 80 hours a week at day labor, where further leisure isn't of great social importance. I would like to get your feeling on that.

Mr. CAREY. Well, in my brief I say that in our industry a 35-hour week should be the workweek. I don't come at that by saying that is what the human body will stand. I don't think that is the way we can go about it because I contend that people are hired not because of their brawn but because of their brains.

Acting Chairman PIKE. So the fatigue element isn't in it as much as it used to be, certainly?

Mr. CAREY. Not in industry generally; in certain industries of course, but that is an exception. I say we have to determine the number of hours worked by what our whole economic set-up will stand. There is such a thing as working too many hours—and we are doing it at the expense of a proper balance and a proper wage structure.

Acting Chairman PIKE. So it is really work spreading you are thinking of rather than the fatigue or leisure factor?

Mr. CAREY. Not only work spreading, but providing an opportunity to help maintain purchasing power.

Acting Chairman PIKE. I meant with all its implications to what spreading work does.

Mr. CAREY. Where you have 12,000,000 people unemployed in the Nation, and a large number in the electrical manufacturing industry, that concerns the industry, because the plant manager is thinking in terms of having 10,000 people outside his plant willing to work for 10 cents an hour less than the person on the job.

Acting Chairman PIKE. That is the point you handled. I wanted to know whether the element of producing fatigue which used to be pretty important when you were working from 7 to 6 hadn't pretty well gone out of most industries, when you had an 8-hour day 5 days a week.

Mr. O'CONNELL. On this matter of reduction of hours it could be argued, I take it, that one might carry the period of reducing hours of employment to such an extent that it would almost be a part of the doctrine of scarcity to which you referred in your article?

Mr. CAREY. If the time came where you had too much purchasing power and not enough products, you might find it necessary to increase the hours. I don't look for it.

Dr. ANDERSON. Mr. Carey, we have frequently referred in these hearings to the effect of technology on older workers. You have pointed out that technological change in your industry has meant the use of semiskilled workers doing comparatively light work—that we call upon brains, not brawn. I presume that older workers could work there about as efficiently as younger workers. Can you tell us what is happening with respect to older workers as technology advances in the electrical industries?

Mr. CAREY. Speed is an important factor, so they would rather have younger workers. We are able to check that somewhat through collective bargaining; on the other hand we can't check it sufficiently as long as there is a vast pool of unused labor before us.

I think as we reduce the number of hours, we can and do reduce the amount of skill required, and we can reduce or improve the opportunity for aged workers. We have in our industry the feeling that 40 years is pretty old, but actually it shouldn't be. I think a person 60 could very easily perform the operations in our industry, at a pace where they more than pay their way.

Dr. ANDERSON. Whose is this feeling that 40 years is old in the electrical industry?

Mr. CAREY. Well, it is a new industry, and many people feel there is a wonderful opportunity in the new industries, that that is the future of America, so we have an influx of young people. The companies of course attempt to retain what they think is the best, and let out the people they feel might be a burden to them in the near future.

We do have pension plans and things like that which will help to keep the situation from becoming worse than it is.

Dr. ANDERSON. Earlier in these hearings Mr. Hook called attention to a study made by the National Association of Manufacturers on workers above 40. Does your organization find any such problem as that of retaining workers of more than 40 years of age?

Mr. CAREY. Yes; we have a great problem in that. Of course I don't know the details of the study made by the National Association of Manufacturers. But I think they could do a lot more than give dinners for people who worked in those companies for 25 or 50 years. It is just what I would term propaganda to justify their position. The same story is the great need for skilled labor. It is just a lot of nonsense. They fail to meet their social obligations, and they are trying to say they meet them very well and they like old people because they are nice to have around. Well, it comes down to doing an operation, and that is what determines whether or not they are going to keep them.

Dr. ANDERSON. Now when you bargain with a particular company how does the age factor enter into the negotiations?

Mr. CAREY. We put the emphasis on length of service. A company will naturally put the emphasis on the ability to produce. We say that the person with the longest service contributed more to the building up of that particular company, and, therefore, has more equity in his job. With the companies today we don't have a great deal of difficulty in collective bargaining. Less than 7 percent of our people have been engaged in labor disputes. Fortunately we deal with companies that are willing to deal in collective bargaining without a great deal of trouble, and we can usually find some just way of handling the problems.

Now it is true that we have some companies which spend thousands of dollars per year to find new ways of handling everything but their labor relations policy. In other words, they want 1945 methods of production and George Washington methods of dealing with the labor union.

UNION AGREEMENTS AS TO LABOR DISPLACEMENT

Dr. LUBIN. Do any of your agreements make any provision for displacement of labor due to changes in methods of production?

Mr. CAREY. Yes, sir; we have some understanding with some of the companies that are written out very carefully. It is hard to find a hard and fast rule but we say in several of our agreements that with a new method of manufacture or new way of producing it, or anything else that involves labor-saving devices, the cost of the engineering operation should be removed from the estimated saving over a period of time, and that saving should be distributed either

in reduced prices or increased wages; or rather the same wages and reduced hours for the employees.

Dr. LUBIN. But the employée was displaced. Is there any provision made for him?

Mr. CAREY. Only on a seniority basis. That is, we attempt to find another job for that employee either within a department or within the plant. Of course, the larger the company, the easier it is to find a job for him, but that eventually displaces someone else, unless a new operation produces a new market.

Dr. LUBIN. The thing that interests me about your testimony is the fact that, after all, you felt that your industry creates technological unemployment in the sense that you make the machine and powder-driven mechanisms that make it possible for other industries to do the work with less labor. Now the general feeling that the average man has, is the more machines that you have, the more displacement and unemployment you have—but you create more employment in making these machines that get rid of labor in other industries.

Mr. CAREY. Once they are made of course the job is over.

Dr. LUBIN. I get from your testimony that in your industry, even though you continue to produce more and more types of machinery, technological displacement due to new devices occurs there, too.

Mr. CAREY. In fact, to a greater extent there than in other industries because it is an industry that was born and lives on technological improvement, and because of its set-up they are able to spread new methods much faster than in other less concentrated industries.

Dr. LUBIN. Do you think the age of the industry has anything to do with the rate of technological displacement? In other words, being new, it wasn't so long ago that the methods were relatively simple—perhaps simple isn't the word I want to use—less well integrated it was a new thing; you just did the best you could, and as time goes on you know more and more about it; you subdivide into more and more parts; you put it on a conveyer and consequently you can take advantage of all modern methods of production. Industries that were older had already reached the stage where they were fairly efficient before this drive on technological improvement started, since, say, 1939.

Mr. CAREY. Well, that is, of course, the reason. There are also other things that come into these new industries. For instance, I think every new industry is without exception a seasonal industry, without any real need for it. Take radios. At one time radios didn't play very well during the summer because of atmospheric conditions, and they sold a lot of radios during the winter, making them in the summer. Today you can use a radio all year round, and still we have those peak periods of production more or less as a carry-over without any really good reason for it. Those things are expensive to the industry itself. In other words, if you could eliminate those bumps in production you could do a better job for labor and consumer as well as industry, because the fixed cost of that plant has to be taken out of 3 or 4 months' production instead of 12.

Dr. ANDERSON. Mr. Carey, what is your opinion as to the rate of maturing in a new industry as a result of technological advance? We have an accumulated technology which speeds the maturing process now, I believe. For instance, from the invention of the automobile

to its commercial production a number of years intervened. The same is true of the airplane. Almost in your own working lifetime, however, has come the inception and development of the radio. Do you have any comment to make on that accumulation of technology?

Mr. CAREY. Well, I attempted to point out that a lot of people regard new industries on the horizon, like television, as the hope of the Nation. But all the experience we have gathered together in other industries will certainly apply to any new industry that comes in. We take a raw material, whether metal or wood, and we develop new ways of handling that now, in plastics and everything else. Well, if an industry still unheard of comes in it will be a very short time before that industry operates efficiently. We won't have what we had in radio, for instance. Radio took from 1927 until 1932 to get into mass production in such a way you could turn it out to be sold in a chain store. Any other new industry that comes into existence won't take 4 years to get on mass production. They will develop it so as to put it in mass production to start off with.

Acting Chairman PIKE. The technique is already available to put it on mass production?

Mr. CAREY. Correct. Radio started out on a bench; television comes in and goes right on the conveyor, right out of the laboratory.

Acting Chairman PIKE. There is another thing I would like to ask. We found in looking over the steel business that in certain cases there had been whole communities that had been displaced, practically put on the bread line by the movement of a part of the industry away from the community—New Castle, Pa., I think was the outstanding instance. I don't think you have had anything that serious, but I would like to know if you can remember in your end of the industry if whole factories were closed up and moved away, moved their operations away, and what they have done in general.

Mr. CAREY. We haven't any cases like that. Our industry decentralized sometime ago. Although it is concentrated east of the Mississippi and north of the Mason-Dixon Line, it is still an industry that is growing. They rapidly displace products, but they take in others in their place. For instance, as one consumer product went out something else would come in, and it is going in that way.

Acting Chairman PIKE. You haven't had in your industry anything similar to what would happen if the General Electric Co. left Pittsfield or Lynn, Mass.? You haven't had any of that wholesale packing up and leaving the whole town broke?

Mr. CAREY. We haven't had anything like that.

Dr. ANDERSON. Mr. Carey, you have noted the effect upon older workers of the advance technology. What about this vast army of young people who have never had permanent connections with industry? Are they being seriously affected by technology?

Mr. CAREY. Very much so; because those people are coming out of school with the idea that they have been trained to go into industry and make good, using their high-school education. Yet in 6 weeks the company can take a person without high-school training and train him for most of the jobs in mass production. Our industry is pretty young. We do not have many people who have been in our industry 25 or 30 years. We have some, of course, that have been in our industry for 25 or 50 years, but there are very few of them, so the people in our industry are not old. There is very little

hope in our industry at the present time to absorb a great number of young people. That problem can only be solved when more people can buy more goods, in my opinion.

Dr. ANDERSON. Your industry is an expanding industry. Is it continuing year by year to employ more workers?

Mr. CAREY. At the present time it is not. We find that there were more people employed in our industry, say, in 1929 than are employed at the present time. Yet we find that some of the large companies are making the same or more profit, and yet operating below capacity. That is something that we fear in the over-all picture. Our industry is producing more than we produced several years ago, and with less people.

Acting Chairman PIKE. Do you have any examples of those companies? I was trying to think of some that would show more than 1929 earnings and I confess I can't do it.

Mr. CAREY. I think I point some out in the brief, I am not certain; if not, I certainly could supply some.

Acting Chairman PIKE. If they are in the brief that will answer my question.

Mr. CAREY. I have a list of all the companies that we have under contract in our industry. Frankly, we are very proud of our record. I would like to give them to the members of the committee. We have between 225,000 and 250,000 under contract in our industry. Of every \$5 worth of electrical equipment made, \$4 worth of it is made under agreement with our union, so we have our industry pretty well organized. I have all the names of all the companies and some of the recent conditions in wages, where they are improved, and places where hours were reduced without reduction in wages.

Acting Chairman PIKE. Might one of those be suitable to put in the record?

Dr. ANDERSON. I should think it would be a good exhibit.

Acting Chairman PIKE. It may be received for file.

(The document referred to was marked "Exhibit No. 2606" and is on file with the committee.)

PROSPECTS FOR ABSORPTION OF UNEMPLOYED

Dr. ANDERSON. Mr. Carey, do you believe that the electrical industry will be able to absorb its proportionate share of the new labor that reaches the market?

Mr. CAREY. No, sir; they can't absorb the labor now available in that industry.

Dr. ANDERSON. You see no immediate prospect that conditions will change?

Mr. CAREY. No, sir; I don't; not at the present hours worked per week.

Dr. LUBIN. Do you know what the situation was at the peak of 1939, November and December, in terms of employment in your industry as compared to, say, 1929?

Mr. CAREY. I would say there were about 350,000 in 1939 as against 400,000 in 1929. I think I cover that in the brief.

Dr. LUBIN. Do you know how that picture was in 1937?

Mr. CAREY. No; but we recognize 1937 as an important year. We took the years 1929, 1931, 1937, and 1939, because we recognized that that was an unusual situation.

Dr. LUBIN. In 1937 you had more employment than you had in 1939?

Mr. CAREY. Yes, sir. The drop from 1937 to 1939 was not as acute as it was in other industries, or in industry generally. In other words, we won't feel the effects of the next depression in our industry as much as industry generally will feel it.

Acting Chairman PIKE. Is that all?

Dr. ANDERSON. Yes. I think Mr. Carey had a witness whom he wanted to bring in.

Mr. CAREY. I wanted to introduce Mr. Driesen, representative of the American Communications Association (C. I. O. union), who would like to present a brief on some questions pertaining to the communications industry.

Acting Chairman PIKE. A statement to read?

Mr. DRIESEN. Yes, sir.

Acting Chairman PIKE. Very well.

Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. DRIESEN. I do.

Acting Chairman PIKE. Will you ask the witness the qualifying questions?

TESTIMONY OF DANIEL DRIESEN, LEGISLATIVE REPRESENTATIVE, AMERICAN COMMUNICATIONS ASSOCIATION (CONGRESS OF INDUSTRIAL ORGANIZATIONS)

Dr. ANDERSON. What is your name?

Mr. DRIESEN. Daniel Driesen.

Dr. ANDERSON. Mr. Driesen, what is your official position?

Mr. DRIESEN. I am legislative representative of the American Communications Association.

Dr. ANDERSON. And what is the American Communications Association?

Mr. DRIESEN. That is the C. I. O. union with jurisdiction over the communications industry.

Dr. ANDERSON. How many members does it have?

Mr. DRIESEN. At the present time it has 21,000 members. These are divided into four main departments: telegraph division, point-to-point radio, broadcast, and marine.

Dr. ANDERSON. Are there any other unions operating in the same field covering the same type of workers?

Mr. DRIESEN. There are several A. F. of L. unions. There is the International Brotherhood of Electrical Workers and the Commercial Telegraphers Union, but there is no other C. I. O. union.

Dr. ANDERSON. You haven't entered the telephone field itself?

Mr. DRIESEN. No; we have not.

During the past decade, mechanization has taken a terrific toll of the jobs of communications workers. I am here particularly concerned with the effects on telegraph workers of changes in the methods of operating the domestic and international telegraph companies, and

the steps our organization has taken to protect communications workers from attempts to install new methods of operation at their expense.

The number of workers employed in the telegraph industry has declined by 31,600 during the past decade. This is almost half the total number presently employed by the radio and wire telegraph companies.

Replacement of the Morse key with the automatic multiplex telegraph and the keyboard printer, which permits the transmission of messages by operators using a keyboard similar to that of the typewriter, has resulted in eliminating thousands of highly skilled Morse operators from the industry. Elimination of the Morse operator is one of the best-known examples of so-called technological displacement.

MECHANIZATION OF TELEGRAPH INDUSTRY

Mr. DRIESEN. At the present time the telegraph industry is again in the process of almost complete remechanization. This process is described by Mr. White, the president of Western Union Telegraph Co., in a speech delivered in New York on February 16, 1939, as follows:

This program falls into four main categories:

The first is extensive development of what now are known as carrier or superimposed circuits, by means of which a pair or a relatively small number of wires or cable conductors may be made to carry a large number of separate channels of communication.

The second is extension of automatic switching between circuits connecting various cities and between central offices and customers, so that direct communication will be effected quickly and without necessity of copying, relaying, or retransmission as practiced generally today.

The third is a wider application of the varioplex, which made possible the creation of a service known as telemeter. The varioplex automatically divides the total "word capacity" of a multichannel single line among a number of subscribers. Each pair of subscribers employs one of the subchannels and is in direct communication simultaneously. Total circuit capacity is at all times equally divided among those who are actually using it at any time; in this way, the idle channel time of each customer is automatically placed at the disposal of other subscribers. Advantage is self-evident.

The fourth is widespread application of the much-discussed system of automatic facsimile telegraphy, permitting transmission and delivery of exact duplicates of the original "copy," be it picture, printed matter, or whatever else.

Facsimile telegraphy in various none too practical forms has been known for many years, but until the invention of R. J. Wise of a dry recording facsimile paper which records direct electrical action without subsequent processing, facsimile had remained impractical. The new carbon-bearing fibrous conducting paper is as sensitive to electricity as photographic paper is sensitive to light. As a result, facsimile has become one of the real contributions to advancement in telegraph history.

So great has been the progress already made in the application of this new method, it would not be surprising if it did not some day in a not too distant future supersede present-day telegraph printers, just as they in their turn superseded the simple instrument of Morse.

With a facsimile as now developed we at last have the automatic telegraph. Thanks to the new paper, telegrams may be loaded and fed automatically into the machines, and when received, dropped onto belt conveyors and delivered to distribution centers. Facsimile telegrams can be relayed as many as three times from the original facsimile copies. Facsimile telegraphy will make the telegraph service increasingly available to the public. Equipment is housed in small, attractive cabinets, into which telegrams may be inserted as easily as letters are dropped into mail boxes.

Looking into the future, we easily can visualize what these basic developments portend. Carrier circuits and the varioplex will enable the telegraph

industry to utilize its present wire plant without addition and serve the telegraph needs of the Nation for many years to come. Automatic switching will provide a tool greatly accelerating business and industry. Facsimile not only will completely eliminate errors in transmission, but, like automatic switching, will provide added speed and convenience to telegraph service. Introduction of facsimile telegraph provides abundant opportunity for exercise of one's imagination. It is conceivable its use even may change our present news distribution system or even the method and manner of printing newspapers themselves.

Inherent in the program of Mr. White for automatic telegraph is a program of wholesale lay-offs for communications employees. He draws an analogy between the introduction of facsimile, which will supersede printers, and the introduction of printers, which superseded Morse.

Rapid progress in mechanization in the radio and cable fields is also under way. Radio Corporation of America Communications has been developing ultrahigh-frequency circuits operated by printer or facsimile. Thus the R. C. A. Communications office in Philadelphia is connected with the New York main office by radio circuit over which messages were transmitted by printer operators at wages as low as \$12 per week until the union obtained its first agreement and raised the minimum wage to \$23 per week. Since the printer was first brought on the scene, R. C. A. C. has not employed any new radio operators. The great majority of R. C. A. C. offices are now printerized and gradually the radio operators formerly employed at these offices are being replaced by printer operators at \$13 a week less than that paid to radio operators.

Facsimile operation is also being installed by both R. C. A. C. and Press Wireless Co.

It is apparent that the communications companies are undertaking a widespread program of mechanization without consideration for the workers involved, and that wherever union organization is not present to prevent it, this mechanization results in unemployment, reduction in wages, increase in speed-up, and worsening of working conditions.

A few days ago Mr. Philip Murray, chairman of the Steel Workers Organizing Committee, outlined in masterly fashion the effects of technological advances on employment and job security in the steel industry. He further laid down a practical program for alleviating the effects of uncontrolled mechanization on the workers in the steel industry.

UNION AGREEMENTS ON TECHNOLOGICAL CHANGE

Mr. DRIESEN. Our organization has been working along the same lines, and the history of our attempts to obtain protection for communications workers from uncontrolled mechanization can be seen in various clauses of our contracts with communications companies.

In our contracts with Mackay Radio, Postal Telegraph, and French Cables, we have insured employees of these companies an opportunity to acquire the skill and training necessary for any new type of operation which might be installed during the life of the contract. The relevant clause in these contracts reads:

If, during the life of this agreement, the company changes its methods of transmitting and receiving messages, or changes its operations in any other respect which will require additional knowledge or skill on the part of the employees, no additional employees shall be hired by the company until the

employees already working shall be notified of such changes and allowed a reasonable training period to acquire the necessary knowledge or skill for retaining his employment. There shall be no change in salary during the training period of any such employee and no reduction in pay upon being reclassified in a new position.

In our contracts with R. C. A. C. the company is required to give the union 6 months' notice in advance of proposed mechanization changes. This section of the contract reads:

The union and the directly affected employees shall be notified at least six months in advance of proposed mechanization changes and such employees shall be allowed an opportunity during said period of at least six months, on their own time, or on the Company's time at the Company's discretion, to acquire such additional knowledge or skill as may be necessary for retaining employment in different classifications. During said six months no new employees shall be added to the regular staff at the office or station affected in the classification or classifications for which the directly affected employees are allowed such opportunity for training.

In the most recent contract signed by our organization with Mackay Radio & Telegraph Co., we have achieved a real guarantee of job security for employees during a period of mechanization. The clause entitled "Mechanization and Technological Changes" of the Mackay agreement reads:

No employee of the Company shall be dismissed by the Company during the life of this agreement because of mechanization or technological changes.

This agreement was signed March 20, 1940, and should be compared with the agreement signed by our organization for the previous year on January 25, 1939. In this agreement we were not able to secure a guarantee against lay-offs, but merely obtained a clause requiring severance pay. This clause read:

In the event any employee covered by this agreement is discharged or dismissed from employment because of technological improvement, he shall be given severance pay according to the following schedule:

1. Employees with five or less years' service shall be given one week's pay for each completed year of service.
2. Employees with more than five years' service shall be given two weeks' pay for each completed year of service.

An even more important consideration for the protection of employees from the threat of mass lay-offs due to mechanization is the provision for improvement of working conditions, guarantee of a full work week, and shorter hours, provided in the contracts of the American Communications Association (C. I. O.) with communications companies.

Thus Mr. Reynolds, a Western Union employee, who testified yesterday before this committee concerning the effects of mechanization in the telegraph industry indicated that in the Western Union Telegraph Co. employees in almost every city in the country are on part time; many of these employees have more than 10 years' seniority.

It is our estimate that about 40 percent of those working for Western Union are on part time. It should be noted that in contrast to this situation in Western Union, which at the present time is unorganized, the A. C. A. has eliminated part timing in companies it has organized and with whom it has contracts.

(Senator O'Mahoney resumed the chair.)

The CHAIRMAN. How have you done that?

Mr. DRIESEN. First by a guaranteed workweek for all employees covered by the contract.

The CHAIRMAN. What effect has that had on the number of persons employed?

Mr. DRIESEN. It happens that there has not been a decline in number, because our contracts also provide for improvement of working conditions and cessation of speed-up, and that has taken up the slack. As a matter of practical experience, no employees have been let off as a result of these contracts.

The CHAIRMAN. What was the cause of the part-timing? Have you covered that?

Mr. DRIESEN. Yes; I did indicate above that a great part of it was due to mechanization, and I indicated that in companies where we had contracts protecting the employees, as far as working conditions went, there was no part-timing.

The CHAIRMAN. Well, if it is due to part-timing, the abolition of speed-up wouldn't affect mechanization, would it?

Mr. DRIESEN. It is my contention that there are several contributing factors which could alleviate the effects of mechanization. One is shorter hours, another is cessation of speed-up, another is bettering the working conditions generally. I point to the fact that in our contracts where we have achieved these things we have eliminated part-timing.

The CHAIRMAN. And what is the workweek under these contracts?

Mr. DRIESEN. It varies. In Postal Telegraph it is a 44-hour week for day workers, 42 for early night, and 41 for late night.

The CHAIRMAN. What was it prior to the signing of the contract?

Mr. DRIESEN. Prior to the signing of the contract it was 48 hours, and that was before the wage-hour law. In the Western Union, which is a parallel case—

The CHAIRMAN (interposing). Well, it could have been 48 hours only for full-time employees. What for these part-time workers?

Mr. DRIESEN. They worked on what are called 4-hour tricks, or 5-hour tricks, or 6, 7, and 8 hours a day. Many of these employees worked only 4 hours a day, assigned some particular time. It is graduated.

The CHAIRMAN. Is that 24 or 28 hours of the week?

Mr. DRIESEN. That would be 24 hours of the week, but a certain percentage would work 4 hours, a certain percentage 5, 6, 7, 8.

The CHAIRMAN. Do we understand that these workers who before the contract was made were getting only 28 hours of the week or 24—which was it?

Mr. DRIESEN. Some were getting 24, some 28; it varies.

The CHAIRMAN. Those who were getting 24 hours of the week are now getting 44?

Mr. DRIESEN. That is right, sir.

The CHAIRMAN. There has been no diminution of the number?

Mr. DRIESEN. That is right, sir.

It follows also that the provisions of the Fair Labor Standards Act, which reduced hours of work in a large section of the communications industry, also tended to mitigate the effects of mechanization on communications employees, since our organization was able to prevent this reduction in hours from being accompanied by a reduction in wages.

In our attempts to protect communications workers from the effects of uncontrolled mechanization, we have been hampered, rather than

aided, by the Government regulatory agency involved, the Federal Communications Commission.

The Federal Communications Commission has made no studies of this question, although it is a major consideration for the workers in the industry, nor has the Commission, in its report to the Interstate Commerce Committee on proposed merger of the telegraph companies, even considered the viewpoint of labor on this question.

It is not even possible to present here in any precise manner the effects of mechanization on the wages of workers in the industry, nor is it possible to ascertain the extent of part-timing and other questions affecting the workers, because the Federal Communications Commission only requires telegraph companies to report rates of compensation rather than actual wages paid, despite the fact that so large a percentage of the workers employed in the industry are now on part time.

CONSOLIDATION AND LABOR DISPLACEMENT

Mr. DRIESEN. The Federal Communications Commission in its report of December 23, 1939, to a subcommittee of the Interstate Commerce Committee investigating the telegraph industry, stated:

Any substantial increase in telegraph traffic consequent on changes and rearrangements of the telegraph tariffs presents no problem from a technical standpoint. Means and methods for handling increased volumes of traffic are common knowledge and it requires only the existence of that traffic and available funds to effect the necessary plant changes. Substitute methods of telegraph transmission, for example, facsimile transmission in place of teletypewriter, printer, or Morse transmission are being investigated. The telegraph carriers, particularly the Western Union, have done substantial work looking to reduction of the cost of telegraph service by major changes in operating practices. Whether these methods are extensively utilized in the future will depend upon the relative magnitude of the cost elements not common to the two methods of transmission.

A consolidated telegraph carrier enterprise should be of sufficient financial strength to permit these operating improvements being adopted rapidly in order that the telegraph service market may be stimulated and expanded by rate reductions consequent on the economies inherent in these new improvements.

The Federal Communications Commission here states that one of the purposes of consolidation would be to enable the companies to remechanize their plants. Consolidation itself, unless the companies are required to specifically guarantee the protection of workers from lay-offs, will result in the loss of thousands of jobs.

The Federal Communications Commission report indicates that the telegraph companies, by consolidation at the expense of workers' jobs, will be financially able to introduce technological changes which will enable them to lay off further workers and reap additional profits.

Yet the program of the companies and the proposals of the Federal Communications Commission provide no specific guaranty of improvement of service to the public and protection of labor.

The international executive board of our union, in considering the present status of the industry, issued the following statement on the questions of merger and mechanization:

At the present time the communications companies are in a critical financial position because of a long and uninterrupted history of financial mismanagement and systematic mulcting of the public and the workers in the industry. The companies are currently seeking a solution to their problem by two

means, mechanization and merger, both of which, under their plans, would result in loss of employment for thousands of workers.

On the question of merger, certain facts must be kept clearly in mind:

1. Merger is a solution being offered by the companies to extricate themselves from a dilemma which they have created;

2. All available evidence indicates that a monopoly, either through merger or liquidation, in the communications industry is inevitable;

3. The public—as well as the workers in the industry—has an interest in the conditions under which any merger may take place.

In the light of these facts, the American Communications Association, C. I. O., takes the following position on the question of any merger plan offered by the companies:

1. It must be in the public interest.

2. It must contain the following guarantees for labor:

(a) No lay-offs

(b) Shorter work week

(c) Guarantee of collective bargaining

(d) Elimination of speed-up and part-timing

(e) Increased wages.

The position of the A. C. A., CIO, may be summed up as follows: While we have concluded that a monopoly through merger or liquidation is an economic inevitability, the terms of any merger are subject to legislative, economic and trade-union influences. We oppose any merger which would result in wholesale lay-offs and other injuries to the workers, and equally obviously we would support any merger which would give all the guarantees outlined above. The A. C. A. will conduct a national campaign to enlist the support of the public, the Government, and all trade unions for the successful consummation of its program.

On the question of mechanization, the companies are constantly developing new machinery for the purpose of laying off highly skilled workers and replacing them with semiskilled or unskilled workers at much lower wages, in order to increase profits. The introduction of new machines can contribute to the general social welfare if the owners of the communications industry can be restrained from using them solely for the purpose of increasing profits for themselves.

Since mechanization is a method for increasing efficiency of operation, reducing costs, and increasing profits, we insist that the workers in our industry shall share in the benefits possible under mechanization, in the form of shorter hours, higher wages, and job security.

The CHAIRMAN. What would be the effect of a merger under such a plan on the efficiency of operation?

Mr. DRIESEN. We believe at the present time that the communications companies are not giving adequate service to the public, either in terms of coverage or in terms of speed. We think that a merger, if it were effected in the interests of labor and the public, would guarantee the public efficient service, would also guarantee to labor good working conditions, and would mean the retention of the jobs of all those presently employed in the industry.

The CHAIRMAN. Is there any relation between the speed-up of which you spoke a little while ago and the speed of transmission of messages?

Mr. DRIESEN. No; I don't think so, except that it affects the accuracy of transmission. A person working under the speed-up will not be able to transmit messages with the accuracy of one working under decent working conditions.

The CHAIRMAN. I was wondering if there was any conflict between your statement that you have tried to eliminate speed-up and the statement that you now make that a merger would result in more rapid transmission.

Mr. DRIESEN. I don't think there is any conflict.

The CHAIRMAN. I thought you might want to clear it up in the event that understanding might be gathered from what you said.

Mr. DRIESEN. I think that the efficiency of operation should be increased, but that the pressure on the individual operator should be decreased.

The CHAIRMAN. What reasons are given for merger?

Mr. DRIESEN. The reasons are a result of the whole economic position of the telegraph industry. During the past few years the industry has been subject to competition by air mail, telephone, and also the telegraph service run by the telephone company. The telephone company does about 40 percent of the telegraph business of the United States over their private-wire service, and also the air mail night letter has practically cut the night letter file of the telegraph companies to pieces.

The CHAIRMAN. From whom has the suggestion for merger come in the first place?

Mr. DRIESEN. Well, in 1935 the Federal Communications Commission recommended to Congress a merger. This recommendation was made at the request of one section of the industry, International Telephone & Telegraph. Since that time all sections of the industry have indicated the desirability of a merger.

The CHAIRMAN. What has been the attitude of the companies involved?

Mr. DRIESEN. The attitude of the companies has been that they favor a merger if it does not restrict them in their allocation of the plant and employment of workers in the processes of the merger.

The CHAIRMAN. Then the companies themselves have not been responsible for the original suggestion.

Mr. DRIESEN. I believe they were. I think the International Telegraph & Telephone Co. first sponsored the suggestion, and as a result of that the F. C. C. in 1934 held hearings, and in 1935 made its recommendation to Congress.

The CHAIRMAN. What are the competitive factors, air mail—

Mr. DRIESEN (interposing). Telephone, private wire service operated by the telephone company, and also there is competition of the radio telegraph companies with the telegraph, like R. C. A. C. and Mackay, and of course, the competition among the telegraph companies.

The CHAIRMAN. In other words, technological advance is increasing competition with this older industry.

Mr. DRIESEN. Yes; and decreasing the participation of the telegraph companies in the total communications business.

Mr. PIKE. In looking over this last page, it would seem to me that the international executive board was a little broad in its statement there. We take it, of course, that that is the opinion of the board, but it referred to their solution being offered to the companies "to extricate themselves from a dilemma which they have created." It is not really a very fair statement. They may have had a part in creating it but you yourself brought out a point I wanted to bring out, that competition from other rapidly improving forms of transmission, of intelligence and communications, has had a great deal to do with this mess that they are in, not wanting to take all the blame off the companies' shoulders.

Mr. DRIESEN. That is true; but I also neglected to point out that part of this dilemma is due to the financial history in the communications industry; for example, the I. T. & T. system and the holding companies, which constitute the telegraph and radio companies, is one of the most intricate holding-company set-ups in the world, I suppose.

Mr. PIKE. Do you suppose the Postal would last 20 minutes longer going into bankruptcy if the I. T. & T. didn't own it?

Mr. DRIESEN. Probably not; but I don't think the Postal would last 10 minutes if they didn't think they would get a merger.

Mr. PIKE. Or they wouldn't if I. T. & T. didn't own and support them.

Dr. ANDERSON. One particular part of your testimony is unusual in this series of hearings. In the history of industrial labor relations, is this the first time that actual contracts have been signed which include that matter of technological displacement?

Mr. DRIESEN. Well, I can't answer that question outside the communications industry. I believe in the communications industry it is.

Dr. ANDERSON. Do you know of any other industry where we have had specific clauses and contracts of this sort?

Mr. DRIESEN. I am not aware of any; I just don't know.

Dr. ANDERSON. Do such contracts in themselves weaken the competitive position of companies which have made liberal agreements, as compared with the others?

Mr. DRIESEN. Well, no; because they are not drastic enough. The last which we obtained from Mackay Radio, providing that no employee during the life of the contract shall be dismissed by the company because of mechanization, is an iron-bound protection for the workers during the life of the contract. The other provisions merely give, I think, an air of decency to the company's throwing a person out of work as a result of change in transmission by giving him a few months' notice, or a few weeks' severance pay. I don't think that they constitute a substantial burden on a large communications carrier, so much so as to lower its competitive position.

Dr. ANDERSON. I understand that severance pay and certain other conditions have been found in contracts of labor unions previously negotiated, but this one in the Mackay contract is a very inclusive obligation, is it not, on the part of the company?

Mr. DRIESEN. Yes, sir. I think the answer to that is found in the economic situation and technical situation in the industry itself as compared with, let us say, the steel industry, as pointed out in Mr. Murray's testimony. That is, the possibilities of improved service, of expansion in the communications industry, are still very great, and in a very decided way the union is doing a great service, insofar as it can by working for more employees in the industry, better service to the public, because that does two things. It increases the efficiency of service, it insures a wider service to the public, and it protects the employees from mechanization, and I think in the end improves the industry. Suppose we take that in reverse. Let's take the actual history of mechanization and lay-offs in a company like the Western Union, where, in order to meet a falling dividend rate the company lays off 10,000 or 15,000 people, let's say, over a period of years. This results in a decline in efficiency of service and a diversion of

business to other forms of communications, such as radio, telegraph, or telephone, which in turn forces the telegraph companies to increase the pace of mechanization, to lay off more people, and so on in a vicious circle. If you can reverse the circle and give better service to the public and increase your facilities, it will put the telegraph companies in a better competitive situation, in a stronger position to bid for business and to survive.

The CHAIRMAN. Are there any further questions?

You have covered all the suggestions that you care to make?

Mr. DRIESEN. Yes, I have, sir.

Dr. LUBIN. I would like to say for the record that the United Textile Workers Organizing Committee and the Amalgamated Clothing Workers have clauses in some of their contracts relative to displacement due to technological changes, although they are not identical.

Dr. ANDERSON. Are they as complete as this last one of the Mackay?

Dr. LUBIN. They are not as complete as this.

Dr. ANDERSON. To my knowledge, this is the most comprehensive single statement that has ever been written into a labor contract on the subject of technology and displacement.

The CHAIRMAN. Was the so-called Washington agreement, which was negotiated by the railroad brotherhoods with the railroads, a first step in this general direction?

Mr. DRIESEN. The Washington agreement provided for a system of severance pay rather than job protection, but it, of course, did provide—

The CHAIRMAN (interposing). That was the first step, was it not?

Mr. DRIESEN. That was in 1936; yes. That was prior to ours.

The CHAIRMAN. Was there anything before that?

Mr. DRIESEN. Not that I know of.

Dr. LUBIN. Has the question ever arisen in the interpretation of your contract as to just what mechanization technological changes mean? Have you ever got to the point where you had to argue this thing out and find out whether this was a technological change?

Mr. DRIESEN. Yes; but we have never had any disagreement with the companies. For example, a change in the method of transmission which required a knowledge of code, say, either Morse or Continental, to a printer-operator who was required to be an expert typist but did not have to know code, would be considered a change in the type of transmission. What we have tried to do is hit the major things, and the companies have never argued with us on this question.

Dr. LUBIN. You have never got to the point where there was a disagreement between you as to what a technological mechanical change is?

Mr. DRIESEN. No, we haven't; but I think there are many places in the communications industry where such a situation might arise. For example, there is a question, in the increased capacity of equipment, increase in the channels of wireless, eliminating maintenance employees and plant employees as to whether or not the change is technological.

The CHAIRMAN. We are very much indebted to you, Mr. Driesen.

Do you care to call anybody else this afternoon?

Dr. ANDERSON. No; but I should like to refer to the testimony of Mr. George Harrison. He has sent in very promptly the table to be

substituted for "Exhibit No. 2541." I should like to submit it instead of the table received yesterday. There are copies here.

The CHAIRMAN. It may be so admitted.

Dr. ANDERSON. Tomorrow morning we are unusually favored by the presence of Mr. Thomas J. Watson, the president of the International Business Machines Corporation, New York City, to open the testimony on the effect of technology on white-collar workers as a result of business-machine changes.

The CHAIRMAN. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon, at 4:45 p. m., the committee recessed until 10:30 a. m. on Friday, April 19, 1940.)

